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The Botanical Institute of the Academy of Sciences of the U. S. S. R.

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Vol. II

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- **Zea mays* L. 4

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* [This index has been reproduced photographically from the Russian original.]

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PREFACE

The second volume of "Flora of the U.S.S.R." describes the largest and economically most important family, namely that of the grasses (Gramineae Juss. or Poaceae R. Br.). Only two families can compare with it as regards the numbers of species, and these are Leguminosae and Compositae. Essentially, the plant cover of the U.S.S.R. is composed of grasses; hence, their importance is particularly great. In view of this, the editors of the "Flora" insisted that the Publishers of the Academy of Sciences issue this large work, "Grasses", as a single book rather than in two or more volumes, so as not to destroy its unity. The size of the single volume made it impracticable to provide an alphabetical index of species and synonyms. It will be possible to publish such an index in the fourth volume, which will conclude the first series of the "Flora" devoted to Monocotyledons.

With reference to the critical comments which the editors have received on the first volume, it must be pointed out that the authors of the "Flora" have to be very cautious about citing published sources, when the actual material, in the form of herbarium specimens, is not available to them. The point is that, having made it a rule to describe the smaller systematic units and to ensure the accuracy of their definitions, the authors of the "Flora" often find it impossible to establish parallelism between their "species" and the "species" of even such an excellent plant taxonomist as the late I. F. Schmalhausen*, not to mention others. When a plant is discussed, it is preferable not to cite at all than to cite some other plant, even though it may have been previously called by the same name.

In the second volume, the authors have begun to include, as supplements, Latin descriptions of those species which are described for the first time in this volume in Russian. According to international rules, species new to science are considered as established only when their descriptions have been published in one of the languages regarded as internationally acceptable. The Russian language is not considered as generally accessible because it is relatively difficult to master, and Soviet botanists should use, in those publications which are of international importance, an international language such as Latin, which is accepted in botany by general consent.

Work on monocotyledons has now been completed, and the manuscripts of the third and the fourth volumes are with the publishers. Let us hope that their publication will not be delayed.

Editors

* [Also referred to as Shmal'gauzen.]

ORDER 4. GLUMIFLORAE

Flowers without a perianth or with perianth represented by bristles, inserted in axile of scaly bracts. Ovary unilocular, with 1 ovule; fruit one-seeded, with farinaceous endosperm.

FAMILY XXIV. GRASSES - GRAMINEAE JUSS.*

Inflorescence terminal (rarely axillary), consisting of numerous, more rarely few spikelets, arranged in spikes, panicles, or racemes. The spikelet consists of bracts arranged in two rows on a short rachilla. There are from 1-10 (-20) perfect or unisexual flowers [florets] in each spikelet. The lower bracts of the spikelet are sterile, usually 2, rarely 1, 3, or 4 in number, and are called empty glumes (glumae). The bracts, which are situated above them and enclose the floret, are known as the floral bracts; the lemma (palea inferior) and the palea (palea superior). The lemma is awned or awnless. The palea is hyaline or coriaceous (it is often absent altogether), somewhat smaller than the lemma; it is enclosed on the outside by the edges of the latter. In many-flowered spikelets the paleas (except those of terminal florets) are turned with their dorsal side towards the rachilla and are always 2-keeled. Perianth is lacking or represented by floral scales, or lodicules (lodicae), of which there are normally 2, more rarely 3 (Stipa) or 1 (Melica). The lodicules are always small, inconspicuous, membranaceous before and after flowering, but succulent at flowering time. The opening of florets, associated with pollination, is brought about by the swelling of lodicules. Cleistogamous grasses do not have lodicules. Stamens usually 3, more rarely 2 (Anthoxanthum, Crypsis), 1 or 6 (Oryza, Zizania, certain Bambuseae); their filament is very thin, slender, elongating at flowering. Anthers versatile, dorsally attached to filaments at about their middle, usually dehiscing by means of a longitudinal slit. Carpels 2-3 fused. Stigmas 2, more rarely 1 or 3, sessile or borne on a small style, often purple or yellow-colored, short-plumose or almost thread-like. Fruit usually dry, called a grain (caryopsis), with pericarp adherent to the actual seed. The lemma and palea also are frequently fused with the fruit. More rarely the fruit is a "bag-shaped" utricle (Schlauchfrucht) with the pericarp loosely enclosing the seed (Crypsis, Sporobolus, Eleusine); or, as in some bamboos, 2 a nut or a berry. Annual, biennial, or perennial herbaceous plants, forming dense swards, sometimes with rhizomes or long underground shoots. Culm cylindrical, more rarely laterally compressed, simple or branched, erect

* Arranged by R. Yu. Roshevita, except for groups specially indicated in footnotes.

or creeping and rooting at nodes. In most grasses the internodes are hollow, more rarely filled with pith (Andropogoneae, Paniceae, Maydeae). Leaf bases (sheaths) open or connate below (Melica, Glyceria, Bromus). Leaves arranged alternately in two ranks, more rarely spirally, linear or elongate-lanceolate. Ligule present in form of small, blunt, pointed, or split membrane, or as a row of small cilia; more rarely lacking.

Analytical Key to Tribes

1. Spikelets 1-flowered, rarely 2-flowered, and then lower floret staminate or abortive. There is no extension of rachilla above the floret. Below the glumes there is usually a point of articulation, so that after ripening the spikelet falls entire, together with the glumes, by breaking off at that point. The inner parts of the floret can be separated from the glumes only by breaking the rachilla 2.
- + Spikelets 1- to many-flowered. There is very often an extension of the rachilla above the floret. Rachilla articulated only above the glumes, so that these persist on the inflorescence after ripening and falling off of the florets. Inner parts of the floret always easily separable from the glumes, even before maturation, when articulation point is evident as a small spine at base of flowering glumes. In 2- to many-flowered florets the rachilla segments are always clearly visible between individual florets 7.
2. Spikelets laterally compressed. Scar at point of seed attachment (hilum) linear (p. 45)* VI. Oryzae.
- + Spikelets dorsally flattened or terete. Scar at point of seed attachment (hilum) dot-shaped 3.
3. All spikelets unisexual, the staminate and pistillate spikelets being arranged (in our species) in separate inflorescences (p. 4) I. Maydeae.
- + All spikelets in inflorescence perfect, or inflorescence consists of unisexual spikelets, staminate and pistillate, alternately arranged. . . 4.
4. Second glume (in our species) covered with hooked spines (p. 23) III. Zoysiae.
- + Second glume glabrous or hairy, but without hooked spines 5.
5. Lemmas cartilaginous or indurate-coriaceous, always harder and thicker than the thinly coriaceous or chartaceous glumes (p. 24). V. Paniceae.
- + Lemmas delicately coriaceous or hyaline, always more delicate and thinner than glumes 6.
6. Spikelets in pairs, one sessile, the other pedicellate. First glume always larger than the second, coriaceous. Lemma and palea hyaline. (p. 5) II. Andropogoneae.
- + Spikelets often unpaired. First glume smaller than the second and coriaceous like the lemma and palea (p. 23) IV. Tristegneae.
7. Culm woody, at least in its lower part. Leaves usually with short petioles, separating from sheaths by articulation. (p. 729) XV. Bambuseae.

* [Russian text page numbers]

- + Culm herbaceous, annual. Leaves always without petiole, passing directly into sheath, sometimes not deciduous 8.
- 8. Spikelets more or less distinctly pedicellate, arranged in a flattened, spikelike or open panicle, or in a racemose inflorescence 9.
- + Spikelets sessile, arranged in two rows on opposite sides or on same side of the rachis, forming a two-sided, one-sided or, more rarely, many-sided spike, or spikes 12.
- 9. Spikelets 1-flowered 10.
- + Spikelets 2- to many-flowered 11.
- 10. Glumes 4, the upper 2 [sterile lemmas] being usually smaller than the lower; if the upper ones are also well developed, a staminate floret develops in the axil of each of them, so that the spikelet becomes 2-3-flowered; palea 1-nerved (p. 51). VII. Phalarideae.
- + Spikelets with 2 glumes, rarely without any glumes; palea 2-nerved (p. 63). VIII. Agrostideae.
- 11. Lemmas usually longer than the glumes, awnless or with a straight, non-geniculate, apical or, more rarely, subapical awn (p. 291) XI. Festuceae.
- + Lemmas usually shorter than the glumes, with a twisted, mostly geniculate, dorsal awn (p. 234) IX. Aveneae.
- 12. Inflorescence always consisting of a single spike 13.
- + Inflorescence consisting of one to several spikes, in digitate or racemose arrangement at the end of rachis (p. 284) X. Chlorideae.
- 13. Lemmas thin, white-hyaline (p. 587) XIII. Leptureae.
- + Lemmas coriaceous, green, not hyaline 14.
- 14. Spikelets turned with the edge toward the axis of the inflorescence. Terminal spikelet with 2 glumes, the others with one, more rarely also with 2 (p. 291) XI. Festuceae.
- + Spikelets turned with the broad side to the axis of the inflorescence, always with 2 glumes 15.
- 4 15. Spike 1-sided; spikelet 1-flowered, attached singly to rachis. Glumes absent (p. 587) XII. Nardeae.
- + Spike 2-sided, rarely 1-sided, and then spikelets many-flowered. Glumes 2 (p. 590) XIV. Hordeae.

Preserved parts of gramae found in excavations are not sufficiently characteristic for different genera to be recognized among them with certainty. It is possible to distinguish with considerable confidence the genera *Arundo* and *Phragmites* in some of the Quaternary layers. Remains described as *Poa*ites should merely be regarded as probable members of the grass family, and they are not included here. Of the genera extinct in the U. S. S. R., a *Bambusa* sp. was indicated in Tertiary layers in the Oligocene of the Middle Dnieper, (Tim), and *Bambusites* sp. in the Paleocene of the Lower Don (Saratov).

TRIBE I. -MAYDEAE MATHIEU

Mathieu Fl. Belg. I (1853) 638.

All florets unisexual. Spikelets with staminate and spikelets with pistillate florets arranged in separate inflorescences (in our species), or in separate parts of the same inflorescence, but never mixed.

Genus ZEA* L.

L. Sp. pl. (1753) 971.

Inflorescences with staminate and pistillate spikelets dissimilar. Spikelet with staminate florets in pairs, one almost sessile, the other pedicellate, arranged in inflorescence forming a terminal panicle. Spikelets with pistillate florets arranged in rows, from 6 to 16, on thick, fleshy axes (cobs), arising in the middle part of the stem from leaf axils. Spikelet with staminate florets contains 1-2(3) florets, with two glumes, a membranaceous lemma and palea, and two fleshy lodicules. Spikelet with pistillate florets 1-flowered, with membranaceous glumes, lemma and palea, without lodicules. Stigma long, filiform, terminally bilobed. At flowering, the stigmas of all spikelets are suspended in a bunch from the leaf sheaths surrounding the cob.

Z. mays L. Sp. pl. (1753) 971; Shmal'g. Fl. II 584. -Kukuruza, mais**
Annual. Culm 100-300 (-500)cm long, hard, filled with pith, leafy.

Leaves linear-lanceolate, broad, with ciliate margins; ligule ca. 5 mm long, ciliate. Staminate spikelets lanceolate, 6-8 mm long and 3 mm broad; glumes acute, downy; lemmas ciliate. Pistillate spikelets short, obtuse, with ciliate glumes and naked lemmas. Kernel, depending on variety, round flattened, or reniform, yellow, reddish, white, dark blue, or green. August-September.

Cultivated in this country throughout the south of the European part of the U. S. S. R., down from 53° N lat., all over northern Caucasus and Transcaucasia, all over the southern cultivation belt of central Asia (except for high mountains), in Far Eastern Territory, and in the Amur and Maritime regions. - Gen. Distr.: cultivated everywhere in tropical and subtropical countries of the globe. Originating in America (Mexico).

5 ECONOMIC IMPORTANCE. One of the most valuable crops, giving highest and constant yields, exceeding the yields of spring wheat 2-3-fold, and those of our winter cereals ca. 1.5 times. Corn has, moreover, low moisture requirements, needing 1/2 or 1/3 of the moisture required by barley or oats, and it suffers relatively little from insect pests which play an enormous part as far as the yields of other cereals are concerned. Corn yields a great number of agricultural products, which are used both as food for man and as feed for livestock and domestic fowl. Corn grain can be made into flour, groats, oil, starch, syrup, alcohol, and many other valuable products. Corn straw can be used as cattle fodder, and corn sown especially for fodder gives a good yield of both herbage and hay. If cut before it is ripe for thrashing, corn is also used for silage which gives a readily eaten and nutritious feed for dairy cattle. Finally, in certain countries, the cob sheaths are used in the production of paper, straw hats, and various small articles, such as little baskets, money boxes, and similar objects.

* Greek name for cereals used mainly as fodder for livestock.

** Local American name.

TRIBE II. -ANDROPOGONEAE PRESL.

Presl. Rel. Haenk. I (1830) 331 emend. Hack. in DC. Monogr. Phaner. VI (1889) 73.

Spikelets perfect, in pairs; one sessile, the other pedicellate. Glumes coriaceous; the lower glume larger, its margins enveloping the second glume. Lemmas hyaline.

Analytical Key to Genera

1. Inflorescence spiciform or weakly branching. Spikelets inserted in notches of the rachis. Lemma always awnless 76. *Hemarthria* R. Br.
- + Inflorescence digitately or paniculately branched. There are no notches for spikelets in the rachis. Lemmas mostly awned 2.
2. All spikelets in inflorescence (both sessile and pedicellate alike, perfect and of equal size. Spikelets always with long silvery hairs . . . 3
- + Spikelets in inflorescence dissimilar; sessile spikelets perfect, pedicellate spikelets staminate, reduced (often to glumes alone) or lacking. Spikelets naked or hairy 8.
3. Branches of inflorescence not jointed 4.
- + Branches of inflorescence jointed. 5.
4. Inflorescence a narrow spikelike panicle. Spikelets awnless 69. *Imperata* Cyr.
- + Inflorescence a broad panicle, fan-shaped or ovoid. Spikelets sometimes awned 70. *Miscanthus* Anderss.
5. Spikelets awnless 71. *Saccharum* L.
- + Spikelets awned 6.
6. Inflorescence digitate 73. *Pollinia* Trin.
- 6 + Inflorescence paniculate, more or less dense 7.
7. Plant large. Panicle from 30 to 60 cm long, densely branching. Leaves long, linear 72. *Erianthus* Rich.
- + Plant of medium size. Panicle from 6 to 15 cm long, sometimes disarticulating. Leaves more or less broad, flat 74. *Spodiopogon* Trin.
8. Inflorescence spreading, consisting of distinct clusters of spikelets [fascicles], arising from the sheaths of upper leaves. Sessile spikelets 2-flowered 75. *Apluda* L.
- + Inflorescence digitate or paniculate. Sessile spikelets 1-flowered . 9.
9. Lemma with dorsally or basally inserted awn. Leaves cordate or amplexicaul 77. *Arthraxon* P. B.
- + Lemma awnless or with apically inserted awn. Leaves linear . . . 10.
10. Inflorescence consisting of spikelike branches, clustered in a digitate or paniculate, terminal bunch 78. *Andropogon* L.
- + Inflorescence paniculate 11.
11. Spikelets with a dense cluster of golden hairs at base, narrow, to 1 cm long and 1 mm broad 79. *Chrysopogon* Trin.
- + Spikelets broadly ovate, without golden hairs at base 80. *Sorghum* Pers.

Genus 69. IMPERATA^c CYR.

Inflorescence terminal, a spikelike compressed panicle, with continuous branches and perfect 1-flowered paired spikelets. Spikelets all alike, surrounded by long silvery hairs which impart a silvery appearance to the entire panicle. Glumes 3, membranaceous, narrow, the first two with long hairs. Lemmas small, hyaline. Stamens 1-2. Stigmas on a long style, plumose.

Perennial. Plant with creeping rhizomes. Culms 25-125 cm tall, naked, 7 surrounded at base by numerous remains of old leaves; leaves narrow 2-4 mm broad, more or less involute, with ligule to 2 mm (var. *europaea* Anderss.) or broader, 4-8 mm, flat, with very short ligule (var. *Thunbergii* Hack.). Inflorescence 5-15 cm long and 2-2.5 cm broad, whitish-silvery. Spikelets to 6 cm long, surrounded by hairs to 1.5 cm of their length; glumes with long hairs; lemmas glabrous, hyaline. April-May. (Plate I, Figure 1, a).

ECONOMIC IMPORTANCE. In spite of its toughness, it is usually eaten by livestock, but is of no special importance as fodder. The beautiful silvery inflorescences are used for dry bouquets. It supplies material for the paper industry and for wickerwork. In tropical countries it often becomes a tiresome weed.

Anders., in Gefv. Vet. Akad. Forh. Stockh. XII (1855) 165

1. Lemma awnless or with a short awn not exceeding the spikelet
 M. sacchariflorus (Maxim.) Hack.
 + Lemma always with a long, conspicuous awn 2

44 From *mischos* = pedicel, *stea*, and *asthos* = flower.

2. Glumes with hairs only at the base, otherwise glabrous *M. sinensis* Anderss.
 + Glumes with hairs not only at the base, but also along the back
 *M. purpurascens* Anderss.

1. *M. sacchariflorus* (Maxim.) Hack. Andropog. (1889) 172. -
Imperata sacchariflora Maxim. Primit. Fl. Amur. (1859) 331. -
 Ic.: Fl. Az. Ross. [Fl. As. Russ.] II (1912) tab. II; Kom. and Al. Oprod.
 (Identif.) I, tab. 42, 1-5. - Exs.: HFR No. 2544 a, b.

Perennial. Plant with underground shoots [rhizomes]; culms 150-200 cm tall, erect, glabrous; leaves linear, 40-60 cm long and to 1.8 cm broad, flat, glabrous. Inflorescence ca. 25 cm long, broadly ovoid or flabellate, whitish, or rosy-silvery, with branches 8-15 cm long; spikelets ca. 5 mm long, surrounded by silky hairs which are twice as long as the spikelets; glumes coriaceous, hairy; lemmas hyaline, naked or almost so; palea much shorter than the lemma. July.

- 8 On flood plains and along river banks. - Far East: - Ze. - Bur.* and Ussur.
 Gen. Distr.: Jap. - Chin. Described from Amur. Type in Leningrad.

ECONOMIC IMPORTANCE. Grown in gardens as a decorative plant.

2. *M. sinensis* Anderss. In Oefvers. Vet. Akad. Forh. Stockh. XII (1855) 165.

Perennial. Rhizome creeping; culm 80-150 cm tall, straight, glabrous, with sparse hairs only below the inflorescence; leaves linear, 50-80 cm long and to 2 cm broad, with scabrous margins, upper surface glabrous, lower surface hairy. Inflorescence 20-40 cm long, obovoid or flabellate, silvery or rosy-silvery; spikelets 5-6 mm long, surrounded by hairs which are 1/4-1/3 longer than the spikelets; glumes coriaceous, glabrous lemmas membranaceous, glabrous; lemma with awn 4-5 times its length; palea awnless; short. July-August.

Mountain slopes. - Caucasus: West, Cauc. - Batumi littoral, adventive or escaped from cultivation. Gen. Distr.: Jap. - Chin. Described from China. Type in Sweden.

ECONOMIC IMPORTANCE. Grown in gardens as ornamental plant.

3. *M. purpurascens* Anderss. in Oefvers. Vet. Akad. Forh. Stockh. XII (1855) 165.

Perennial. Rhizome creeping; culms 80-120 cm tall, erect, glabrous, somewhat hairy below the inflorescence; leaves linear, 40-60 cm long and to 1.8 cm broad, glabrous above, with sparse hairs underneath; inflorescence ca. 30 cm long, obovoid or flabellate, of silvery-rose color, with branches up to 20 cm long; spikelets 5-6 mm long, surrounded by hairs which slightly exceed them in length. The glumes coriaceous in the upper part with hairs, the sterile lemma glabrous, fertile lemmas membranaceous, glabrous; lemma with awn 3-4 times its length; palea awnless, short, July-August. (Plate I, Figure 2, a).

On dry grassy slopes. - Far East: Ussur. Gen. Distr.: Jap. - Chin. Described from China. Type in Sweden.

ECONOMIC IMPORTANCE. Deserves attention of gardeners, as it is just as beautiful as the foregoing species.

* [For this and other abbreviations appearing in this text, see List of Abbreviations, p. 624.]

Genus 71. SACCHARUM* L.

L. Gen. pl. (1737) 18

Inflorescence paniculate, large, silky, with articulated branches. Spikelets surrounded by long hairs, in pairs, one sessile, the other pedicellate, awnless, alike, perfect. Glumes coriaceous, pointed; sterile lemma hyaline. Fertile lemma hyaline, palea small or lacking. Stamens 3. Stigmas plumose.

- 9 1. *S. spontaneum* L. Mant. II (1771) 183. -*Saccharum spontaneum* subsp. *indicum* var. *genuinum* Hack. Andropog. (1889) 114. -Ic.: Fl. Az. Ross. [Fl. As. Russ.] II (1912), tab. III. -Exs: HFR No. 1197.

Perennial. Rhizomatous; culms 100-200 cm tall, hard, glabrous; leaves narrow-lanceolate, involute, with long hairs at base; ligule short. Panicle to 50 cm long, lanceolate, dense, silvery, with brittle [disarticulating] branches. Spikelets 3-4 mm long, surrounded by hairs which are 3-6 times their length; glumes long-pointed, with ciliate margins. Lemma very small or lacking; palea of same size as lodicules. May-July. (Plate I, Figure 3, a).

Along river banks and in flooded places. -Centr. Asia: Kara-Kum., Amu-Dar., Syr-Dar., Pam. -Al. Gen. Distr.: Iran, Ind.-Him. Described from India (Malabar Coast). Type in London.

ECONOMIC IMPORTANCE. Cords are made by local population from the sheaths and leaves, while pen-like sticks used for writing are cut from the culms. These pens are called "Kalam". The plant can be used for paper making. It is not readily eaten by cattle, and only to a slight extent by camels. It is frequently a weed. The juice contains 2-4% saccharose. Can be used for silage.

Genus 72. ERIANTHUS** RICH.

Rich. in Michx. Fl. Bor. Amer. I (1803) 54.

Inflorescence paniculate, large, woolly, with articulated branches. Spikelets in pairs, lanceolate, perfect surrounded at base by long hairs, awned. Glumes coriaceous, sterile lemma hyaline. Fertile lemma hyaline, attenuate into a long awn, palea obtuse. Stamens 2-3. Stigmas plumose.

1. *E. purpurascens* Anderss. in Oefv. Vet. Akad. Forh. Stockh. XII (1855) 161. -*Erianthus Ravennae* var. *purpurascens* Hack. Andropog. (1889) 140. -*E. Ravennae* Griseb. in Ldb. Fl. Ross. IV (1853) 475 non P. B.; Shmal'g. Fl. II 586. -Ic.: Fl. Az. Ross. [Fl. As. Russ.] II (1912), tab. IV and V. -Exs.: HFR No. 1046 (sub *E. Ravennae* var. *purpurascens*).

Perennial. Grows in large clumps. Culms 100-200 cm tall, hard, glabrous, to 1 cm thick; leaves narrow-linear, to 1.5 cm broad, with a thick midrib; ligule short, hairy. Panicle lanceolate, dense, branching, 30-60 cm long, gray-woolly; spikelets ca. 4 mm long, surrounded by hairs of

* From Greek *saccharos* = internal siliceous concretions of bamboo stems, the so called "tabashir".

** From *erion* = wool, and *anthos* = flower.

the same length; glumes reddish-brown, short-acuminate, sparingly hairy; sterile lemma much smaller, with ciliate margins; fertile lemma hyaline, attenuate into a long, straight awn to 6 mm long. July-August. (Plate I, Figure 4, a).

- 10 Along river valleys, on alluvial and loess soils. -Caucasus: all regions; Centr. Asia: Kara-Kum., Upp. Turkm., Amu-Dar., Syr-Dar., Pam. -Al. Gen. Distr.: Balk. -As. Min., Iran, Ind. -Him. Described from the East. Type in Sweden.

ECONOMIC IMPORTANCE. Turkmenians manufacture ropes, "rasman-alafi", and writing pens. They use the culms of this plant and of the common cane for making baskets and mats. The plant is often grown along field edges forming dense thickets which serve as protection against spring floods. Culms and leaves are used for thatching. Before discarding, the panicles are eaten by all kinds of livestock. It is used as fuel. It can be employed for silage. It is suitable for the manufacture of coarse grades of paper.

Genus 73. POLLINIA* TRIN.

Trin. in Mém. Acad. Pétersb., sér. 6, II (1833) 304.

Inflorescence terminal, usually digitate, with shortened, articulated rachis and articulated branches. Spikelets in pairs, both 1(-2)-flowered, perfect, with (in our species) short hairs at base. Glumes more or less coriaceous, sterile lemma membranaceous, shorter than the glumes. Fertile lemma with awn arising at its apex, more rarely awnless. Palea sometimes lacking. Stamens 3. Stigmas plumose.

1. Articulations of axis and branches of inflorescence with hairy edges, at least in lower part. Culm always distinctly branching
 *P. imberbis* Nees.

- + Articulations of axis and branches of inflorescence glabrous, more rarely with single, short cilia. Culm not branching
 *P. nuda* Trin.

1. *P. imberbis* Nees ex Steud. Syn. Gram. I (1855) 410. -*Arthraxon nodosus* Kom. in A. H. P. XVIII (1900) 448.

Annual. Roots long, thin; culms 40-100 cm tall, ascending, rooting at nodes, branching, glabrous; leaves lanceolate, to 8 cm long and 12 mm broad, glabrous, with sparse hairs on upper surface; ligule short, hairy. Inflorescence digitate, with 2-6 (rarely 1) branches, 4-7 cm long; articulations of axis and branches of inflorescence hairy along the ribs, at least in lower part; spikelets 4.5-6 mm long, lanceolate, green; glumes glabrous, scabrous along the nerves; lemma short, ovate, with long awn, rarely awnless (var. *willdenowiana* (Nees) Hack.); palea lacking. August-October.

In weed-infested places, often as a noxious weed. -Caucasus: West, Transcauc.; Far East: Ussur. Gen. Distr.: Ind. -Him., Jap. -Chin. Described from Nepal (India). Type in London.

* Named after Siro Pollini, doctor and professor of botany in Verona, 1782-1833.

NOTE. The appearance of this plant in the Caucasus dates, according to A.A. Grossheim, from the years 1917-20. It has already taken a firm hold among the weed vegetation of the Batum littoral and has a tendency towards further expansion.

2. *P. nuda* Trin. in Mém. Acad. Pétersb., sér. 6, II (1833) 307.

Annual. Roots long, thin; culms 25-100 cm tall, ascending, often rooting at nodes, glabrous, unbranched; leaves narrow-lanceolate, 2.5-6 cm long and 5-8 mm broad, glabrous, with sheaths densely ciliate at margins; ligule short, glabrous. Inflorescence with 4-6 thin digitate branches, loose, drooping; articulations of the axis and branches of inflorescence glabrous, rarely with single cilia; spikelets ca. 4 mm long, lanceolate-acute, naked, with short hairs at base; glumes glabrous. Lemma with awn, 15-18 mm long; palea lacking. August-October (Plate I, Figure 5, a, b).

As adventive weed. -Caucasus: West. Cauc. Gen. Distr.; Ind. -Him., Jap. -Chin. Described from Nepal (India). Type in Leningrad.

Genus 74. *SPODIOPOGON** TRIN.

Trin. Fund. Agrost. (1820) 192, tab. 97.

Inflorescence paniculate, compressed, with articulated branches. Spikelets in pairs, one sessile, the other pedicellate, 2-flowered, the lower flower staminate, the upper perfect. Glumes thin-coriaceous, hairy, sterile lemma hyaline, enclosing the staminate flower. Fertile lemma hyaline, deeply bifid, awned, longer than palea. Stamens 3. Stigmas long, linear.

1. *S. sibiricus* Trin. Fund. Agrost. (1820) 192; Griseb. in Ldb. Fl. Ross. IV, 476. -*Andropogon sibiricus* Steud. Syn. Gram. I (1855) 398. -Ic.: Fl. Az. Ross. [Fl. As. Russ.] II (1912) fig. 3. -Exs.: HFR No. 2393 a, 2393 b.

Perennial. Plant with long rhizomes; culms 60-150 cm tall, glabrous; leaves linear-lanceolate, flat, glabrous; ligule serrate, 1-1.5 mm long. Inflorescence to 15 cm long, narrowly elongate, hairy; spikelets in pairs, 1 sessile, the other pedicellate; the lower 2 glumes pubescent; lemma of perfect flower bilobed from the middle, with a twisted awn to 12 mm long arising from between the lobes. June-August. (Plate I, Figure 6, a).

In dry meadows and on stony slopes. -East Siberia: Ang. -Sayan., Daur.; Far East: Ze. -Bur., Ussur. Gen. Distr.; Mong., Jap. -Chin. Described from Siberia. Type in Leningrad.

12

Genus 75. *APLUDA*** L.

L. Sp. pl. (1753) 82.

Inflorescence consisting of separate little clusters of spikelets, arising from the sheaths of upper leaves. Spikelets in threes; sessile, 2-flowered,

* From *spodios* - gray, and *pogon* - beard.

** A term for chaff, employed by Pliny.

with lower floret staminate and upper perfect; the second floret on a short, broad pedicel, staminate or abortive, scalelike; the third on a longer pedicel, staminate or neuter, rarely perfect. Lower glumes straight, the upper convex, keeled. Fertile lemma hyaline, bifid at apex, awned or awnless; palea small or lacking. Stamens 3. Stigmas short-plumose, protruding at the sides.

1. *A. inermis* Rgl. in A.H.P. VII (1880) 658. - *Apluda varia* Hack. subsp. *mutica* Hack. var. *humilis* Hack. subvar. 1. *typica* Hack. Andropog. (1889) 198.

Annual. Plant with thin roots, branching at base; culms 50-75 cm tall, ascending, glabrous, smooth; leaves narrow-lanceolate, flat, scabrous. Ligule to 2 mm long, cleft. Inflorescence to 30 cm long, with widely separated clusters of spikelets, surrounded by lanceolate bracts, consisting of sheaths of upper leaves; spikelets ca. 3.5-5 mm long, 1-2-flowered, bluish-green, always awnless. July-August. (Plate I, Figure 7 a, b).

Along river banks and irrigation ditches, and also in wet meadows. - Centr. Asia: Syr-Dar. and Pam. - Al. Endemic. Described from environs of Namangan. Type in Leningrad.

ECONOMIC IMPORTANCE. Yields thin straw, suitable for hat making.

Genus 76. HEMARTHRIA* R. BR.

R. Br. Prodr. Fl. Nov. Holl. (1810) 207.

Inflorescence consisting of separate compressed spikes, arising singly or in fascicles from axes of upper leaves. Spikelets in pairs, in notches of rachis; one sessile and fertile, the other pedicellate, often abortive. Lower glume coriaceous, upper glume and sterile lemma hyaline. Fertile lemma hyaline, obtuse. Stamens 3, stigmas plumose.

1. Plant large, 70-125 cm tall, leaves 5-10 mm broad. Spikelets with callus about 1 mm long. 2. *H. japonica* (Hack.) Roshev.
- + Plant not exceeding 60 cm in height; leaves 3-5 mm broad. Spikelets with callus ca. 2 mm long. 1. *H. fasciculata* (Lam.) Kunth.
1. *H. fasciculata* (Lam.) Kunth. Revis. Gram. I (1829) 453. - *Rottboellia fasciculata* Lam. III gen. I (1791) 204. - *R. compressa* var. *fasciculata* Hack. Andropog. (1889) 286. - Exs.: Kneucker, Gram. exs. No. 181 (1902).

- 13 Perennial. Long underground shoots; culms 40-60 cm tall, often branching more or less ascending, glabrous; leaf sheaths with ciliate margins in upper part. Leaves 3-15 mm broad, acuminate, smooth, glabrous; ligule short, ciliate. Spikes several, 4-6(10), arising from leaf axes; spikelets linear-lanceolate, 4-7 mm long, with callus ca. 2 mm long; first glume with distinct nerves, coriaceous. Lemmas hyaline. July-August.

Along stream borders and in wet meadows. - Caucasus: West. Cauc. Gen. Distr.: Mediterranean. Described from Italy.

ECONOMIC IMPORTANCE. It is of no fodder value, as it produces rather coarse hay, and therefore little occurs in the U. S. S. R.

* From hemi - half, and arthron - joint.

2. *H. japonica* (Hack.) Roshev. comb. nova. - *Rottboelia compressa* var. *japonica* Hack. Andropog. (1889) 288. - *R. japonica* Honda in Tokyo Bot. Mag. XLI (1927) 8. - Ic.: Kom. and Al. Oprod. (Identif.) I, tab. 43.

Perennial. Long underground rhizomes. Culms 70-125 cm tall, often branching, ascending, glabrous, smooth; sheaths without cilia; leaves linear-acute, 5-10 mm broad, in upper third hispidulous; ligule short, ciliate. Spikes subcylindrical, 4-8 cm long and 2-4 mm broad, in groups of 1-2(-4), glabrous spikelets linear-lanceolate, 4-7 mm long, with a short callus ca. 1 mm long. First glume with pronounced nerves, coriaceous. Lemmas hyaline. July-August. (Plate I, Figure 8, a).

Along river valleys and in abandoned pastures. - Far East: Ze. - Bur., Ussur. Gen. Distr.: Jap. - Chin. Described from Japan. Type in Vienna.

NOTE. It is undoubtedly a subtropical element which entered into the U. S. S. R. from China.

ECONOMIC IMPORTANCE. Of no importance as fodder, as it is rare in occurrence.

Genus 77. *ARTHRAxon** P. B.

P. B. Agrost. (1812) 111, tab. 11, fig. 2.

Inflorescence terminal or partly axillary, digitate or more rarely paniculate. Spikelets in pairs, more rarely solitary; one sessile, perfect, often awned, the other pedicellate, staminate or abortive. Glumes coriaceous, sterile lemma hyaline. Fertile lemma hyaline, keeled, usually awned; palea small or lacking. Stamens 2-3. Stigmas plumose.

1. *A. Langsdorffii* (Trin.) Hochst. in Flora (1856) 188. - *Pleuropplitis Langsdorffii* Trin. Fund. (1820) 174; Griseb. in Ldb. Fl. Ross. IV, 477. - *Arthraxon ciliaris* subsp. *Langsdorffii* Hack. Andropog. (1889) 354. - Exs.: HFR No. 1149 (sub *Pleuropplitis*).

- Annual. Roots thin, fibrous; culms 20-80 cm tall, thin, ascending, 14 branching at base; leaves cordate-lanceolate, amplexicaul, glabrous, ciliate only along the margins (var. *genuinus* Hack. et var. *cryptatherus* Hack.), or ciliate-pubescent all over the surface (var. *centrasiaticus* Hack.); ligule to 2 mm long, ciliate. Inflorescence a digitately branching raceme; spikelets green or more or less lilac-colored, linear-lanceolate; first glume with 7-10 nerves, coriaceous, hispidulous, the second with 3 nerves, sterile lemma hyaline; fertile lemma hyaline with a geniculate awn, 5-9 mm long, more rarely awnless, or with awn not exceeding 1/2 length of spikelet (var. *cryptatherus* Hack.) July-September (Plate I, Figure 9, a).

In wet meadows and weed-infested places. - Caucasus: West, and East. Transcauc.; Far East: Ze. - Bur., Ussur.; centr. Asia (only var. *centrasiatica* Hack) Pribalkh., Syr-Dar., and Tyan'-Shan. Gen. Distr.: Mong., Jap. - Chin. Described from Japan. Type in Leningrad.

ECONOMIC IMPORTANCE. Of no importance as fodder, as it occurs in insufficient quantity.

* From *arthron* = joint, and *axon* = axis.

Genus 78. ANDROPOGON* L.

L. Spec. pl. (1753) 1045.

Inflorescence consisting of spike-like branches, arranged in terminal clusters. Spikelets in pairs, one sessile and perfect, the other pedicellate, staminate or neuter. Glumes thin-coriaceous, the sterile and fertile lemma membranaceous. The lemma of the perfect floret with a long awn. Stamens 3. Stigma plumose.

- 1. Inflorescence digitate, consisting of 2-10 spike-like, clustered branches A. ischaemum L.
- + Inflorescence paniculate, consisting of numerous, clustered branches A. caucasicus Trin.

1. A. ischaemum L. Sp. pl. (1753) 1047; Griseb. in Ldb. Fl. Ross. IV (1853) 477; Shmal'g. Fl. II, 585; Kryl. Fl. Zap. Sib. [Fl. West. Sib.] II, 148. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 54, fig. 1500. -Exs.: HFR No. 500.

Perennial. Rhizome short-creeping; culms 30-80 cm tall (5-10 cm in var. minor Roshev.), ascending, glabrous or pubescent below the nodes (var. songoricus Rupr.); leaves linear; ligule ciliate. Inflorescence consisting of 2-10 spike-like branches; the pedicels of spikelets and the rachis have a deep, elongated groove and are covered with long hairs; spikelets elongate-linear, greenish or light purple; the first glume hairy at base, the second ciliate along the keel and margins, sterile lemma glabrous, hyaline; fertile lemma transformed into a long, geniculate awn. Anthers yellow, rarely violet (f. ionantherum G. Wor.). July-August. (Plate I, Figure 10, a, b).

On dry hills and in steppes. -Eur. pt.: Upp. Dnep., Volg. -Don., Pridnepr., Crimea, Low. Don., and Low. Volg. (a single indication for Astrakhan); Caucasus: all regions; West. Siberia: Irt., Centr. Asia: Aral. -Casp., Pribalkh., Dzung. -Tarb., Kara-Kum., Upp. Turkm., Amu-Dar., Syr-Dar. Pam. -Al., Tyan'-Shan. Gen. Distr.: Centr. Eur., Mediterranean, Balk. -As. Min., Arm. -Kurd., Iran, Ind. -Him., Dzung. -Kashg., Mong., Jap. -Chin. Described from Southern Europe. Type in London.

ECONOMIC IMPORTANCE. A fairly good pasture plant for dry places. There are indications (Rollov, and others) that 130,000 kg of roots of this plant are annually imported into France, where the roots, bleached with boiling water, are used for the manufacture of all kinds of brushes used in perfumery.

2. A. caucasicus Trin. in Mem. Acad. Pétersb. sér. 6, II (1833) 286. -Andropogon intermedius var. caucasicus Hack. Andropogon. (1889) 486. -Sorghum caucasicum Griseb. in Ldb. Fl. Ross. IV (1853) 476. -Exs.: HFR No. 1747.

Perennial. Underground rhizomes; culms 40-150 cm tall, ascending, sometimes weakly branching; leaves narrow, linear; ligule ciliate. Inflorescence 5-10 cm long, consisting of numerous, paniclately arranged branches; pedicels of spikelets and rachis joints with a deep, elongate groove; spikelets elongate-linear, greenish-violet; first glume scaberulous-hairy, second similar to the first, but naked; sterile lemma hyaline, half

* From Greek andros - man, and pogon - beard.

the size of the first; fertile lemma represented by a geniculate awn to 15 mm long. July-August.

On dry slopes, in sandy places, and along borders of irrigation ditches. -Caucasus: Ciscaucasia, Dag., West., East., and South. Transcauc.; Centr. Asia: Syr-Dar., Pam. -Al. Endemic. Described from Caucasus. Type in Leningrad.

Genus 79. CHRYSOPOGON* TRIN.

Trin. Fund. Agrost. (1820) 187.

Inflorescence paniculate, with verticillate branching. Spikelets laterally compressed, in threes, one sessile and perfect, the other two pedicellate, staminate or abortive. Glumes coriaceous, the sterile and fertile lemmas membranaceous. Fertile lemma entire or with two short teeth at apex, and with a more or less well developed awn. Stamens 3. Stigmas minutely plumose.

1. *Ch. gryllus* (L.) Trin. Fund. Agrost. (1820) 188; Shmal'g. Fl. II, 687. -*Andropogon gryllus* L. Amoen. Ac. IV (1759) 332. -Lc.: Rchb. Ic. Fl. Germ. I, tab. 54, fig. 1502. - Exs.: Fl. Exs. austro-hungar. No. 1484.

Perennial. Grows in swards; culms 50-120 cm tall, ascending, glabrous, scabrous under the inflorescence; leaves narrow-linear, sparsely hairy.

- 16 Ligule ciliate. Panicle to 20 cm long, loose; spikelets with a cluster of golden hairs at base, to 1 cm long and ca. 1 mm broad; glumes coriaceous, in the sessile spikelet with rows of stiff cilia at the apex near the margins, and in the pedicellate spikelets awned; lemma of perfect spikelet with geniculate awn to 4 cm long, while in pedicellate spikelets the awns are short, not geniculate. June-July. (Plate I, Figure 11, a).

In meadows. -European part: Crimea, Prichern. [Black Sea area]; Caucasus: Ciscauc., Dag., East. Transcauc. Gen. Distr.: Medit., Balk. -As. Min., Ind.-Him. Described from Europe. Type in Leningrad.

ECONOMIC IMPORTANCE. Dried roots of *Chrysopogon* are used for manufacture of brushes. It is employed in mat weaving and thatching. It contains essential oil.

Genus 80. SORGHUM** PERS.

Pers. Syn. (1805) 101.

Inflorescence paniculate, dense. Spikelets in pairs, one sessile and perfect, the other pedicellate, staminate or neuter; terminal spikelets in threes, all more or less dorsally flattened. Glumes coriaceous, sterile and fertile lemmas membranaceous. Fertile lemma bifid at apex, with a long awn, rarely awnless. Stamens 3. Stigmas plumose.

* From Greek *chryso* - golden, and *pogon* - beard.

** Italian popular name of this plant, possibly of Arab origin.



1. Wild, perennial plant, with long, branching rhizomes, Culm not exceeding 2 m in height; leaves 1-2 cm broad 1. *S. halepense* (L.) Pers.
- + Cultivated plants, up to 2 and more m tall, always annuals, without rhizomes; leaves 4-9 cm broad 2.
2. Spikelets large, 7-8 mm long *S. sudanense* (Piper) Stapf.
- + Spikelets not exceeding 5 mm in length 3.
3. Culm bent below the inflorescence, so that the top of the panicle droops *S. cernuum* Host.
- + Culm not bent below the inflorescence, panicle erect 4.
4. Axis of inflorescence short, lateral branches very long, greatly overtopping the axis. The general shape of the inflorescence flabellate *S. technicum* (Koern.) Roshev.
- + Axis of inflorescence elongated, lateral branches shorter than the axis. The general shape of the inflorescence ovoid or elongate 5.
5. Spikelets awnless. Glumes almost black, caryopsis white *S. bicolor* (L.) Moench.
- + Spikelets awned. Glumes light-colored, caryopsis always more or less colored 6.
6. Inflorescence broadly ovoid. Spikelets light-colored, plant occurring only in the Far East *S. japonicum* (Hack.) Roshev.
- + Inflorescence ovoid or elongate. Spikelets brownish or dark brown. Plant occurring in this country only in the Caucasus and in central Asia *S. vulgare* Pers.
- ++ Inflorescence long-ellipsoid. Spikelets straw-colored or rufous. Plant occurring in this country in the Lower Volga Region and in the Caucasus *S. saccharatum* (L.) Pers.

Series 1. *Vulgariae* Roshev. - Annual plant, with nondisarticulating spikelets, cultivated.

S. vulgare Pers. Syn. I (1805) 101; Shmal'g. Fl. II, 586. - *Holcus sorghum* L. Sp. pl. (1753) 1047. - *Andropogon sorghum* Brot. Fl. lusit. I (1804) 88. - *A. Sorghum* subsp. b. *sativus* Hack. *Andropog.* (1889) 505.

Annual. Roots fibrous. Culms 200-250 cm tall, stout, filled with pith; leaves strap-shaped, up to 7 cm broad, glabrous, with sharply scabrous margins; ligule short, ciliate. Inflorescence paniculate, ovoid or ellipsoid, 12-25 cm long; spikelets in twos(threes), one sessile, broadly ovoid, the other on a short pedicel, lanceolate; the glumes coriaceous, pubescent or almost glabrous at maturity; sterile lemma hyaline; fertile lemma hyaline,

Explanation to Plate I

1. *Imperata cylindrica* (L.) P.B., a) spikelet, -2. *Miscanthus purpurascens* Anders., a) spikelet, -3. *Saccharum spontaneum* L., a) spikelet, -4. *Erianthus purpurascens* Anders., a) spikelet, -5) *Pollinia nuda* Trin., a) spikelets, b) spikelet dissection. -6) *Spodiopogon sibiricus* Trin., a) spikelet, -7. *Apluda inermis* Rgl., a) and b) details of spikelet, -8. *Hemarthra japonica* (Hack.) Roshev., a) detail of spikelet, -9. *Arthraxon Langsdorffii* (Trin.) Hochst., a) spikelet, -10. *Andropogon ischaemum* L.: a) spikelet, b) section of inflorescence branch with extension, -11. *Chrysopogon gryllus* (L.) Trin., a) spikelets, -12. *Sorghum halepense* (L.) Pers., a) spikelet, -13. *Tragus racemosus* (L.) Desf., a) spikelet, -14. *Arundinella anomala* Steud., a) inflorescence branches, b) spikelet

short with awn 4-9 mm long, all more or less colored. Maturing in various regions June-October.

Cultivated in the south of the Soviet Union. -European part: Low. Volg.; Caucasus: Caucasus: Ciscauc., West. Transcauc.; Centr. Asia: Kyz., -Kum., Kara-Kum., Syr-Dar., Pam., -Al. Gen. Distr.: Medit., Dzung. -Kashg., Ind., -Him. Described from India.

ECONOMIC IMPORTANCE. A good fodder plant, almost equalling corn in its attributes. It yields 2-3 cuttings per summer; yield of herbage 150-350 (-500) centn.* per hectare; hay harvest 30-80 centn. In countries supplied with more valuable cereals it is used for the feeding of cattle and domestic fowl, while in tropical countries it is a common cereal. The grain is used for distillation of alcohol and for the production of starch. In some, as yet not fully elucidated conditions, it produces prussic acid (chiefly young plants), and it can then be poisonous.

S. cernuum Host., Gram. Austr. IV (1809), tab. 3. -*Andropogon sorghum* subsp. b. *sativus* = *cernuus* Koern. in Hack. *Andropog.* (1889) 515. -*l.c.*: Fl. Az. Ross. [Fl. As. Russ.] II (1912), tab. VI, 1.

Annual. Distinguished by the following: culm bent below the inflorescence, so that the top of the panicle hangs down. Panicle ovoid, very dense, 8-12 cm long and 6-12 cm broad. Caryopsis spherical.

Cultivated: Centr. Asia: Kyz., -Kum., Syr-Dar., Pam., -Al., Gen. Distr.: Persia, Hindustan, India, Medit., tropical Africa.

ECONOMIC IMPORTANCE. It is cultivated in large quantity in the delta of Amu-Darya, especially as fodder for horses. In many places the nomadic population of Uzbekistan prepares a special kind of food called "Kuzya" from its seeds and juice.

S. technicum (Koern.) Roshev. sp. nov. in Addenda p. 739. -*Andropogon sorghum* subsp. b. *sativus technicus* Koern. in Hack. *Andropogon.* (1889) 508. -*l.c.*: Fl. Az. Ross. [Fl. As. Russ.] II (1912) tab. VI, 2.

Annual. Distinguished by the following: panicle erect. Inflorescence axis much reduced, so that it is many times exceeded by the lateral branches. Panicle flabellate, drooping to one side, to 70 cm long; lemma with awn 6-10 mm long.

Cultivated: Caucasus: Ciscauc., centr. Asia: Kyz., -Kum., Syr-Dar. Gen. Distr.: Medit., Dzung. -Kashg., N. Am.

ECONOMIC IMPORTANCE. Cultivated as material for manufacture of brooms and brushes. In the Osh area [Kirgizia], tips of the branches of this sorghum are used instead of tea, hence the [local] name *chai-dzhugora* (Korzhinskii).

S. bicolor (L.) Moench. Meth. (1794) 207. -*Holcus bicolor* L. Mant. II (1771) 301. -*Andropogon sorghum* subsp. b. *sativus*, *cc. bicolor* Koern. in Hack. *Andropogon* (1889) 519. -*l.c.*: Fl. Az. Ross. [Fl. As. Russ.] II (1912) tab. VI, 3.

Annual. Panicle erect, elongate, 10-20 cm long, very dense, not bending. Spikelets broadly ovoid, with lustrous black glumes, always awnless, caryopsis protruding, white or light brown.

Centr. Asia: According to indications of Acad. Korzhinskii, it is grown in Fergana (Uzbekistan). Gen. Distr.: Iran, Ind., -Him., Jap., -Chin.

ECONOMIC IMPORTANCE. It is mainly cultivated for the grain which is used for human consumption as well as for fodder.

* One centner = 100 kg.

S. japonicum (Hack.) Roshev. sp. nov. in Addenda p. 739. - *Andropogon sorghum* subsp. b. *sativus* ~~Yv~~vulgaris, subvar. *japonicus* Hack. *Andropogon* (1889) 515. - Ic.: Fl. Az. Ross. [Fl. As. Russ.] II (1912) tab. VI, 5.

- 21 Annual. Panicle erect, ovoid, 15-20 cm long, more or less dense, with upwards projecting branches. Spikelets light-colored. First glume with numerous prominent nerves.

Far East. Grown only in Ussur. Gen. Distr.: Jap.-Chin.

ECONOMIC IMPORTANCE. Grown mainly as a cereal plant; grain is used for porridge making, baking of flat cakes, and distillation of alcohol. Leaves, and occasionally grain, are fed to cattle, and the harder culms are used as fuel and thatching. It is one of the main sources of livelihood for the population of North China.

S. saccharatum (L.) Pers. Syn. I (1805) 101; Shmal'g. Fl. II, 585. - *Holcus saccharatus* L. Sp. pl. (1753) 1047. - *Andropogon sorghum* subsp. b. *sativus*, η *saccharatus* Koern. in Hack. *Andropogon*. (1889) 509. - Ic.: Fl. Az. Ross. [Fl. As. Russ.] II (1912) tab. VI, 4.

Annual. Panicle erect, elongate, not dense, with long branches, slightly drooping at the tips. Spikelets ellipsoid, with awn to 10 mm long, finally turning brown.

Cultivated. European part: Prichern., Low. Volg.; Caucasus: Ciscauc., West, Transcauc. Gen. Distr.: Medit.; almost all Africa, N. Am.

ECONOMIC IMPORTANCE. Cultivated as a sugar, fodder, and grain plant. Mature culms contain 12-18% sugar, and in this respect this plant is not inferior to sugarcane. Sorghum sap however contains a mixture of sugars and it does not crystallize; it is therefore mainly used for syrup making. As a fodder sugar sorghum in fresh state considerably surpasses corn, and is readily eaten by livestock as it is sweeter. It makes good recovery growth, so that it can be cut 2-3 times a year. Yields are 90 tons of herbage per hectare. Like common sorghum, it may be poisonous under certain, very rare conditions, as it can form cyanide compounds.

In tropical countries the grain is used for making flour and groats. Where more valuable cereal plants are available, it is used as feed for livestock and domestic fowl, and also as a source of starch and treacle.

Series 2. Halepenses Roshev. - Annual, wild plants, with disarticulating spikelets.

1. *S. halepense* (L.) Pers. Syn. I (1805) 101. - *Holcus halepensis* L. Sp. pl. (1753) 1047. - *Andropogon halepensis* Brot. Fl. Lusit. I (1804) 89. - *A. sorghum* subsp. a *halepensis* var. a *halepensis* Hack. *Andropogon*. (1889) 502. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 51, fig. 1503. - Exs.: Fl. cauc. exs. No. 26.

- 22 Perennial. Short, creeping rhizome; culm 100-150 cm tall, smooth, nearly to 1 cm thick; leaves linear-lanceolate, 1-1.5, rarely 2 cm broad var. *latifolium* Willk. et Lange) glabrous; ligule 1-2 mm long, ciliate. Panicle up to 40 cm long, with numerous spikelets. Spikelets ovate-lanceolate, ca. 5 mm long, more or less hairy; glumes acute, often glabrous at the back. Fertile lemma hyaline, usually awned, more rarely awnless (var. *muticum* Hack.), palea small, ciliate. June-August. (Plate I, Figure 12, a).

Usually a weed.—European part: Crimea; Caucasus: Ciscauc., West., East., and South. Transcauc., Tal.; Centr. Asia: Kara-Kum., Upp. Turkm., Amu-Dar., Syr-Dar., Pam.—Al. Gen. Distr.: Medit., Centr. Europe; Balk.—As. Min., Arm.—Kurd., Iran, Ind.—Him., Dzung.—Kashg. cribed from the Mediterranean. Type in London.

ECONOMIC IMPORTANCE. In North America "Johnson grass" is considered as one of the most troublesome weeds, infesting the greater part of the United States, and capable, under certain (rather rare) conditions, to bring about the death of livestock, on account of the formation in this plant of poisonous cyanide compounds. In this country this grass has so far attained a restricted distribution, and hence no great damage due to it has been observed. In young state it is a fodder plant. Rhizome contains 27% starch and 13% sugar. The culms are used for wattling.

S. sudanense (Piper) Stapf, Fl. of trop. Afr. IX (1917) 113.—*Andropogon sorghum sudanensis* Piper in Proc. Biol. Soc. Wash. XXVIII 33.—*Sorghum exiguum* auct., non Piper.

Annual. Roots numerous, fibrous; culms 150–300 cm tall and 3–9 mm thick, glabrous, smooth, strongly branching at base; leaves broadly lanceolate, 45–60 cm long and 4–4.5 cm broad, glabrous; ligule ca. 2.5 mm long, truncate; panicle pyramidal-ovoid, ca. 40 cm long, with numerous spikelets; spikelets lanceolate to elliptical-elongate, 7–8 mm long and 3 mm broad. Glumes acute, often naked at the back; lemmas hyaline, the fertile lemma ca. 6 mm long, with a geniculate awn up to 2 cm long, palea ovate, ca. 3.5 mm. long. July–September.

Cultivated.—European part: Mid. Dnep., Low. Don., Low. Volg.; Caucasus: Ciscauc., East. Transcauc. Gen. Distr.: wild in Sudan and along the river Nile; cultivated in the southern part of Europe, in North and East Africa, in India, North America, Antiles, South America, and Australia.

ECONOMIC IMPORTANCE. An excellent fodder plant, distinguished by a high nutritive value and good adaptability, it is readily eaten by livestock, both in pasture and in the form of hay. Can be cut 2–3, or even 4, times in this country. Under various conditions of the Soviet Union the hay yields of Sudan grass range from 9–150 centners per hectare, averaging 45–60 centners, while seed yields amount to 8–9.5 centners per hectare. Like other sorghum species, it may be poisonous under rare occurring conditions.

TRIBE III. — ZOISIEAE* MIQ.

Miq. Fl. Ind. bat. III (1857) 365.

Inflorescence usually spikelike, with a continuous axis and spikelets falling off in groups. Spikelets mostly 1-flowered, perfect. Glumes coriaceous, harder than the lemma and palea, sometimes covered with uncinat bristles. Lemmas hyaline, awnless.

* Named after K. Zois who lived in Australia at the end of the 18th century and collected a number of rare plants of Carniola.

Genus 81. TRAGUS* HALL.

Hall, Hist. Scirp. Helv. II (1768) 203.

Inflorescence terminal, cylindrical, with short branches. Spikelets lanceolate, one-flowered. First glume small or lacking, the second glume large, coriaceous, covered with hooked spines. Lemma and palea thin, glabrous. Stamens 3. Stigmas long-plumose. Caryopsis elongate, free.

1. *T. racemosus* (L.) Desf. Fl. atl. II (1800) 386; Shmal'g. Fl. II, 587. — *Cenchrus racemosus* L. Sp. pl. (1753) 1049. — *Lappago racemosa* Willd. Sp. pl. I (1797) 484; Griseb. in Ldb. Fl. Ross. IV, 467. — Ic. Rhb. Ic. Fl. Germ., tab. 30, figure 1414 (sub *Lappago*). — Exs.: Fl. Cauc. exs. No. 254.

Annual or biennial. Grows in tufts, culms 10–30 cm tall, somewhat procumbent, rooting at nodes, branching; leaves 4–6 cm long and 2–3 mm broad, hard, with stiff cilia along the margins; ligule short, ciliate; raceme cylindrical, 4–8 cm long and to 1 cm broad, with short branches, measuring 2–3 mm; spikelets lanceolate, ca. 5 mm long, in clusters of 3–4 which disarticulate as a unit. July–September. (Plate I, Figure 13, a).

In sandy places, along roads, and in steppes. — European part: Mid. Dnep., Prichern., Crimea, Low. Don.; Caucasus: Ciscauc., Dag., West. East., and South. Transcauc.; Centr. Asia: Kara-Kum., Upp. Turkm., Gen. Distr.: Centr. Eur., Medit., Balk. — As. Min., Iran. Described from southern Europe. Type in London.

ECONOMIC IMPORTANCE. Weed. Of no importance as fodder. In Australia it is considered as a good pasture plant for winter use.

TRIBE IV. — TRISTEGINEAE** NEES

Nees in Hook. et Arnott, Bot. Beechey's Voy. (1841) 237.

Spikelets perfect, not paired, 1–2-flowered. Glumes of almost the same consistency as lemmas, first glume shorter than second glume and sterile lemma (when present).

24

Genus 82. ARUNDINELLA† RADDI

Raddi, Agrost. brasil. (1823) 37, tab. 1.

Inflorescence terminal, dense, more rarely spreading. Spikelets usually in pairs, on pedicels of unequal length, 1–2-flowered, the upper perfect, the lower staminate. First glume short, obtuse, the second longer, acute or awned. Sterile lemma obtuse, often covering the staminate floret. Fertile lemma obtuse, awnless or sometimes awned. Stamens 3. Stigmas plumose.

* From Greek *Tragos* = he-goat, name applied to a thorny (horned) plant.

** From *tris* = three, and *stegi* = cover.

† From *Arundo* — see genus 147.

A. anomala Steud., Syn. Gram. I (1855) 116.—*Panicum mand-
schuricum* Maxim. in Mém. Acad. Pétersb. IX (1859) 328.—Exs.: HFR
No. 2394.

Perennial. Rhizomatous plant with long-lanceolate leaves and more or
less flattened, dense panicle, 50–100 cm tall. Spikelets ovate-lanceolate,
2-flowered, with a lower staminate and upper perfect floret; glumes with
prominent nerves, the first somewhat inflated, about half as long as the
spikelet; lemma of the perfect floret with short silvery hairs at base. There
are no awns. July–September. (Plate I, Figure 14, a, b).

Dry slopes, wastes, sand dunes, and coppices.—Far East: Ze. —Bur.,
Ussur, Gen. Distr.: Jap.—Chin. Described from Japan. Type in Oxford.

ECONOMIC IMPORTANCE. In Japan and China it is considered as a
good fodder plant. It is readily eaten by horses.

TRIBE V.—PANICEAE R. BR.

R. Br. in Flinders Voy. II App. III (1814) 582.

Spikelets perfect, 1–2-flowered. Fertile lemma, indurate-coriaceous,
always easily distinguishable in color and shape from the thin-coriaceous
or chartaceous glumes and sterile lemma.

Analytical Key to Genera

1. Spikelets naked at base, or with short hairs which do not attain the
length of spikelet 2.
- + Spikelets surrounded at base by long hairs or bristles which exceed the
length of spikelet and represent sterile branches of inflorescence . . 8.
2. Spikelets with two glumes and a single perfect floret 3.
- + Spikelets with two glumes, a sterile lemma, and a perfect floret or
with a staminate or neuter floret in the axil of the sterile lemma. . . 4.
3. Spikelets with a cushionlike swelling at base
- 84. *Eriochloa* H.B. et K.
- + Spikelets without a cushionlike swelling at base
- 83. *Paspalum* L.
- 25 4. Inflorescence consisting of 2–6 spikelike branches, digitately arranged
at the end of the culm 85. *Digitaria* Heist.
- + Inflorescence not digitate 5.
5. Spikelets subsessile, arranged on one side of inflorescence branches
. 6.
- + Spikelets on long branchlets, arranged on various sides of inflorescence
branches 88. *Panicum* L.
6. Glumes awned 89. *Oplismenus* P.B.
- + Glumes awnless, acute 7.
7. Inflorescence racemose; spikelets sessile, arranged on one side of
rachis in two close rows, always awnless
- 86. *Brachiaria* (Trin.) Griseb.

- + Inflorescence somewhat branching; spikelets in clusters of 2-4, usually awned, rarely awnless 87. *Echinochloa* P.B.
- 8. After ripening spikelets fall off, while surrounding bristles remain on the rachis. Bristles stiff 90. *Setaria* P.B.
- + After ripening spikelets fall off together with surrounding bristles. Bristles soft, silky 91. *Pennisetum* Rich.

Genus 83. PASPALUM* L.

L. Syst. ed. 10 (1759) 855.

Inflorescence consists of 2-5 spike-like branches arranged in a loose raceme. Spikelets 1-flowered, more or less round, flat on ventral side and convex on the dorsal side [plano-convex], arranged in two close rows on one side of flattened or more or less winged rachis, always awnless. Glumes hyaline, the sterile lemma, when present, toothlike. Fertile lemma cartilaginous after flowering. Stamens 3. Stigmas plumose.

- 1. Plant with creeping rhizomes. Leaves to 5 mm broad. Inflorescence consisting of only two spike-like branches... 1. *P. digitaria* Poir.
- + Plant without creeping rhizomes. Leaves to 10 mm broad. Inflorescence consisting of 2-6 spike-like branches 2.
- 2. Spikelets 3-3.5 mm long, more or less softly pubescent 2. *P. dilatatum* Poir.
- + Spikelets 2.5-3 mm long, naked. 3. *P. Thunbergii* Kunth.

1. *P. digitaria* Poir. Encycl. Suppl. IV (1816) 316.-

Perennial. Rhizomes creeping, underground; culms 20-50 cm tall, glabrous, smooth, erect; leaves lanceolate-linear, 4-12 cm long and 2-5 mm broad, glabrous or with scattered hairs at base; ligule short. Inflorescence consisting of 2 (-3-4) spike-like branches, 2.5-5 cm long; spikelets imbricate, rounded-pointed, ca. 2.5 mm long, glabrous; glumes with 3, sterile lemma with 5 nerves; fertile lemma obtuse, cartilaginous after flowering. August-October. (Plate II, Figure 1, a, b).

In wet and weedy places, sometimes among rice.-Caucasus: west. Transcauc., Tal. Gen. Distr.: tropical and subtropical countries of both hemispheres. Described from North America (Carolina, Charleston). Type in Paris.

2. *P. dilatatum* Poir. Encycl. V (1804) 35.

Perennial. Without creeping rhizomes. Culms 30-80 cm tall, ascending, glabrous, smooth; leaves lanceolate-linear, to 8 mm broad, glabrous, only at margins sharply scabrous, with more or less long hairs at base; ligule ca. 1-3 mm long. Inflorescence consisting of 2-5 spike-like branches 5-12 cm long; spikelets round, slightly pointed, 3-3.5 mm long, on short pedicels, ca. 1 mm long; Glumes with 5-7 nerves, the lower fringed with long hairs, the upper with sparse hairs; fertile lemma round, cartilaginous after flowering. August-October.

Along roads and in weedy places. Caucasus: west. Transcauc. Gen. Distr.: originating in South America, but occurs also in North America and in southern Europe (adventive). Described from Buenos Aires. Type in Paris.

* From *paspalos*-name given to millet by Hippocrates.

ECONOMIC IMPORTANCE. In America it is considered as a good fodder plant, and is therefore grown in considerable quantity. In Europe it has not attained wide distribution, while in the U.S.S.R. it occurs so far only as an adventive weed.

3. *P. Thunbergii* Kunth ex Steud. Syn. Pl. Gram. (1855) 28.

Perennial. Forming swards; culms 30-80 cm tall, erect, glabrous, smooth; leaves linear-lanceolate, to 9 mm broad, flat, hairy; ligule 1-2 mm long, obtuse. Inflorescence of 2-4(-6) spike-like branches, 3-8 cm long; spikelets round slightly pointed, 2.5-3 mm long, on short pedicels, ca. 1 mm, glumes with 3, the sterile lemma with 5 nerves; fertile lemma obtuse, cartilaginous after flowering. July-September.

In wet meadows and by standing water. -Caucasus: West. Transcauc. Gen. Distr.: Jap.-Chin. Described from Japan. Type in Switzerland.

ECONOMIC IMPORTANCE. It is considered as a fodder plant in Japan.

Genus 84. *ERIOCHLOA** H.B. et Kunth

H.B. et Kunth Nov. gen. et spec. I (1815) 94,
tab. 30 et 31.

Inflorescence consisting of branches in racemose arrangement, on which spikelets are arranged in a one-sided raceme in 2 rows. Spikelets ovate, 1-flowered, perfect, with a cushionlike swelling at base. Glumes 2, almost alike, thin, more or less acute. Lemma cartilaginous after flowering, sometimes with a short awn, palea obtuse. Stamens 3. Stigmas plumose.

- 27 1. Spikelets small, ca. 3 mm long and 1-1.5 mm broad. Species occurring only in the Aralo-Caspian Depression 1. *E. succincta* (Trin.) Kunth.
+ Spikelets 4-5 mm long and 2-3 mm broad. Species occurring only in the Far East 2. *E. villosa* (Thbg.) Kunth.

1. *E. succincta* (Trin.) Kunth, Enum. pl. I (1833) 73; Griseb. in Ldb. Fl. Ross. IV, 467; Shmal'g. Fl. II, 588. -*Paspalum succinctum* Trin. Diss. II (1826) 119.

Annual. Roots thin, fibrous. Culms 25-70 cm tall, geniculately ascending, soft-pubescent thin, 0.25-0.5 mm in thickness, with narrow leaves (var. *gracilis* Roshev.) or robust, 2-2.5 mm thick, with broad leaves (var. *robusta* Roshev.) leaves flat, pubescent; ligule short, ciliate. Inflorescence narrow-elongate, 3-15 cm long; branches, as well as the main axis, triquetrous, pubescent; spikelets ca. 3 mm long and 1-1.5 mm broad, covered with more or less appressed hairs. July-August. (Plate II, Figure 2, a, b).

Along river bends that become inundated. -European part: Low. Volg.; Caucasus: East. Transcauc.; Centr. Asia: Kara-Kum., Kyz.-Kum. Endemic. Described from Astrakhan. Type in Leningrad.

2. *E. villosa* (Thbg.) Kunth, Rev. Gram. I (1825) 203. -*Paspalum villosum* Thbg. Fl. Jap. (1784) 45. -*Id.*: Kunth., *Id.*, tab. 13.; Thbg. *Id.*, tab. 8.

Annual or biennial. Roots fibrous; culms 30-80 cm tall, branching, erect or ascending, more or less pubescent; leaves linear-lanceolate, flat,

* From Greek *erion*-wool, and *chlos*-grass.

-pubescent as are the sheaths; ligule ciliate. Inflorescence narrow, ca. 10 cm long, with triquetrous branches, pubescent like main axis; spikelets 4-5 mm long and 2-3 mm broad, more or less finely pubescent, with a cushionlike swelling at base and a fringe representing rudiment of sterile lemma. July-September. (Plate II, Figure 3, a, b).

Grows on arable land and around houses as a weed. Far East: Ze.-Bur., Ussur. Gen. Distr.: Jap.-Chin. Described from Japan. Type in Sweden, in Uppsala.

ECONOMIC IMPORTANCE. Fodder plant of mediocre value.

Genus 85. DIGITARIA* HEIST.

Heist. ex Adams. Fam. (1763) 38 et 550

Inflorescence consisting of 2-6 spikelike branches, in digitate arrangement at the end of the culm. Spikelets 1-2-flowered, in pairs, one subsessile, the other pedicellate, arranged in two rows on one side of the rachis. Lower glume very small or lacking. Fertile lemma indurate-coriaceous after flowering, always awnless. Stamens 3. Stigmas plumose.

- 28 1. Spikelets small, 1.5-2 mm long, rounded-lanceolate 2.
 + Spikelets larger, 2-3 mm long, narrow-lanceolate 3.
 2. The entire plant glabrous, with only a small number of long, erect hairs at the base of leaf blades . . . 1. *D. linearis* (Krock.) Crep.
 + Leaf sheaths with long hairs, at least at the margins. Leaf blades with sparse long hairs. Spikelets soft-pubescent
 2. *D. longiflora* Pers.
 3. Inflorescence branches with long scattered hairs at the base of spikelets. Lower glume obsolete or lacking. Nerves of glumes parallel, approx. 3. *D. horizontalis* Willd.
 + Inflorescence branches glabrous. Lower glume always discernible. Nerves of glumes not parallel, lateral nerves arcuately deviating from median nerve 4.
 4. Marginal nerves of palea woolly-pubescent 4. *D. sanguinalis* (L.) Scop.
 + Marginal nerves of palea with long, spreading cilia 5. *D. ciliaris* (Retz.) Koel.
 1. *D. linearis* (Krock.) Crep. Man. ed. 2 (1866) 335. - *Panicum lineare* Krock. Fl. sil. (1787) 98; Shmal'g. Fl. II, 588; Kryl. Fl. Zap. Sib. (Fl. west. Sib.) II, 149. - *P. glabrum* Gaud. Agrost. helv. (1811) 22. - *Digitaria humifusa* Pers. Syn. I (1805) 85. - *D. glabra* P. B. Agrost. (1812) 51; Griseb. in Ldb. Fl. Ross. IV, 468, -lc.: Rchb. lc. Fl. Germ. I, tab. 27, figure 1406. - Exs.: HFR No. 42.

Annual. Plant green or more or less reddish (f. *sanguinea* Roshev.), with ascending, more or less branching, glabrous culms, sometimes rooting at nodes, 5-50 cm tall. Leaves linear-lanceolate, glabrous or with few long hairs at base; ligule 1-2 mm long. Inflorescence of 2-5 spikelike branches; spikelets to 2 mm long, rounded-lanceolate, 1-2-flowered; first glume very small or lacking, second glume and sterile lemma of same

* From *digitus* - finger.

length as spikelet, with 3-5 and 5-7 nerves respectively. Fertile lemma glabrous, with involute margins. July-September. (Plate II, Figure 4, a, b, c).

In sandy places, often as weed. -European part: all regions (except Kar. -Lap. and Dv.-Pech.); Caucasus: Ciscauc., West. and East. Transcauc.; West. Siberia: Alt.; East. Siberia: Ang.-Sayan., Daur.; Far East: Ze. -Bur., Ussur.; Centr. Asia: Aral.-Casp., Dzung.-Tarb., Syr.-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk., -As. Min., Arm.-Kurd., Ind.-Him., Jap.-Chin. Described from Southern Europe.

ECONOMIC IMPORTANCE. Considered a good fodder plant, especially in pasture. Suitable for sand consolidation. In the Caucasus young sprouts of this plant are used in food by local population.

- 29 2. *D. longiflora* Pers. Syn. I (1805) 85. - *Paspalum brevifolium* Fluegge, Monogr. (1810) 150. - *P. chinense* Nees in Hoek. et Arn. Bot. Beechey's Voy. (1841) 231.

Annual. Plant green or slightly reddish, with ascending, more or less branching, glabrous culm, 25-40 cm tall; leaves long-lanceolate, with sparse erect hairs, and sheaths with long hairs all over the surface or at least at the margins; ligule ca. 1.5 mm long. Inflorescence of 2-6 spikelike branches; spikelets ca. 1.5 mm long, rounded-lanceolate, greenish. First glume lacking, the second glume and sterile lemma of same length as spikelet, softly pubescent, with 3-5 and 5-7 nerves respectively; fertile lemma glabrous, indurate, in the case of ripe caryopses almost black. August-September.

In weedy places. -Caucasus: West. Transcauc. (Chakva, in tea plantations). Gen. Distr.: India, Japan, and hot countries of the Old World. Described from Inida-Malabar.

ECONOMIC IMPORTANCE. It is considered as a pasture plant in tropical countries.

3. *D. horizontalis* Willd. Enum. Pl. Hort. Berol. (1809) 92. - *Panicum horizontale* G. Mey. Prim. Esseq. (1818) 54. - *P. sanguinale* var. *horizontale* E. Mey. ex Rich. Tent. fl. Abyss. (1851) 361.

Annual. Culms 50-150 cm tall, ascending, more or less branching, glabrous; leaf sheaths with spreading hairs, rarely glabrescent; leaves long-lanceolate, rather densely covered with long hairs; ligule ca. 2-2.5 mm long. Inflorescence consisting of 6-12 spikelike branches, vested with scattered long hairs; spikelets ca. 2.5 mm long, narrowly lanceolate. First glume small, obsolete, the second half as long as the spikelet, the sterile lemma enclosing the whole spikelet and having 5-7 nerves; lemmas glabrous. August-September.

As weed in crops. -Caucasus: Dag., East. Transcauc. Gen. Distr.: tropical Africa and America. Described from Santo Domingo. Type in Berlin.

ECONOMIC IMPORTANCE. In Africa it is considered as a good pasture plant.

4. *D. sanguinalis* (L.) Scop. Fl. Carn. ed. 2, I (1772) 52; Griseb. in Ldb. Fl. Ross. IV, 468. - *Panicum sanguinale* L. Sp. pl. (1753) 57. - Shmal'g. Fl. II, 588. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 27, fig. 1407. - Exs.: HFR No. 1200.

Annual. Plant green or more or less reddish; culms 10-70 cm tall, ascending, glabrous; leaves linear-lanceolate, 4-10 cm tall and to 1 cm broad, like the sheath with long spreading hairs glabrescent (var. *glabrata* Trautv.); ligule short. Inflorescence of 4-7 spike-like branches, 3-10 cm long, more rarely inflorescence of 8-18 branches attaining 15-23 cm in length (var. *australis* Griseb.); spikelets ca. 3 mm long, narrowly lanceolate; first glume minute, the second about half the length of spikelet, the sterile lemma enclosing the whole spikelet, with 5-7 nerves and woolly-pubescent margin; fertile lemma glabrous. July-September. (Plate II, Figure 5, a, b).

- 30 In sandy soil, mainly as weed.-European part: all regions; Centr. Asia: Kara-Kum., Upp. Turkm., Amu-Dar., Syr.-Dar., Pam.-Al. Gen. Distr.: hot and temperate zones of both hemispheres. Described from southern Europe. Type in London.

ECONOMIC IMPORTANCE. Cultivated in North America under the name "crabgrass" as an excellent fodder plant. Suitable for pasture and for consolidating sand. Crabgrass grain is used for preparation of starch and also a fine white meal which compares in quality with semolina. In India crabgrass is mainly cultivated as a reserve for famine years, as this meal keeps well and is not susceptible to damage by insects. Used in the paper industry.

5. *D. ciliaris* (Retz.) Koel. Descr. Gram. (1802) 27; Griseb. in Ldb. Fl. Ross. IV, 468.-*Panicum ciliare* Retz. Obs. IV (1786) 16.-*Panicum sanguinale* var. *ciliare* Trin. Sp. gram. icon. (1829) tab. 144.-*lc.*: Rechb. Ic. Fl. Germ. 1, tab. 27, fig. 1408.

Annual. Plant usually grayish-green; culms 10-50 cm tall, ascending, branching, glabrous; leaves long-lanceolate, 4-8 cm long and to 1 cm broad, like the sheaths with long spreading hairs; ligule short. Inflorescence of 4-6 spike-like branches, attaining 12 cm in length; spikelets ca. 3 mm long, narrow-lanceolate, grayish-green; first glume minute, the second amounting to half the length of spikelet, the sterile lemma enclosing the whole spikelet, with 5-7 nerves and margin bearing long, spreading, bristle-like cilia. July-September. (Plate II, Figure 6, a).

On sands along the sea coast, often as weed.-European part: Mid. Dnep., Crimea, Low. Don., Low. Volg.; Caucasus: Ciscauc., West. and East. Transcauc., Tal. Gen. Distr.: hot and temperate zones of both hemispheres. Described from Egypt. Type in Switzerland.

AGRICULTURAL IMPORTANCE. It has the same uses as the preceding species.

Genus 86. BRACHIARIA* (TRIN.) GRISEB.

Griseb. in Ldb. Fl. Ross. IV (1853) 469.

Inflorescence racemose, with sessile spikelets arranged on one side of rachis in 2 approximate rows. Spikelets 1-flowered, ovate-acuminate, dorsally flattened, awnless. Glumes thin, ovate, with prominent nerves, first glume shorter than the second glume and sterile lemma. Fertile

* From brachium - arm, branch.

lemma with five inconspicuous nerves, more or less cartilaginous. Stamens 3. Stigmas plumose.

1. *B. eruciformis* (Sibth.) Griseb. in Ldb. Fl. Ross. IV (1853) 469. *Panicum eruciforme* Sibth. Prodr. Fl. Graec. I (1806) 40. — *Panicum caucasicum* Trin. Sp. Gram. Ic. (1828-36) tab. 262. — Ic.: Trin., I. c; Rchb. Ic. Fl. Germ. I, tab. 29, fig. 1413.

- 31 Annual. Growing in swards; culms 15-30 cm tall, ascending, branching, rooting at nodes, vested with soft hairs, in upper part almost leafless; leaves narrowly lanceolate, to 4 mm broad and, like the sheaths, vested with soft hairs; ligula hairy. Inflorescence 3-8 cm long, terminal; spikelets ovate, blunt, ca. 2 mm long, dorsally flattened; first glume minute, obsolete, the second glume and sterile lemma of same length as the spikelet, strongly pubescent, with 5 nerves; fertile lemma glabrous, lustrous, cartilaginous. August-October. (Plate II, Figure 7, a, b).

In weedy places. — Caucasus: East. and South. Transcauc.; Centr. Asia: Upp. Turkm., Syr. — Dar. Gen. Distr.: East. Medit., Iran, Ind. — Him. Described from Greece. Type in Oxford.

ECONOMIC IMPORTANCE. Of no forage value; grown in gardens as an ornamental plant and for dry bouquets.

Genus 87. ECHINOCHLOA* P.B.

P.B. Agron. (1812) 53.

Spikelets 1-flowered, pointed or blunt, on short pedicels or subsessile, arranged in clusters of 2-4 on one side of panicle branches. Glumes and sterile lemma thinly coriaceous, the first glume shorter than the second glume and sterile lemma which are often awned. Very often an additional adventitious lemma develops in the axil of the sterile lemma and, like the latter, it belongs to an abortive, supernumerary lower floret. Fertile lemma indurate-coriaceous, awnless. Stamens 3. Stigmas plumose.

- | | |
|--|--|
| 1. Culms prostrate 10-30 cm tall. Spikelets about 2 mm long | 3. <i>E. colona</i> (L.) P.B. |
| + Plant erect, attaining 120 cm in height | 2. |
| 2. Spikelets large, 4-5 mm long. Weeds of rice fields | 3. |
| + Spikelets small, 2.5-3 mm long | 4. |
| 3. Leaf blade, especially of young leaves, with a band of dense hairs at base | 4. <i>E. oryzicola</i> Vasing. |
| + Leaf blade quite glabrous at base | 5. <i>E. macrocarpa</i> Vasing. |
| 4. Glumes awnless, merely pointed | 2. <i>E. frumentacea</i> (Roxb.) Link. |
| + Glumes long-awned | 7. |
| 5. Glumes glabrescent or hispidulous. Cultivated plant | 6. <i>E. spiralis</i> Vasing. |
| + Glumes more or less intensely hispid. A weed | |
| 6. Inflorescence branches arranged more or less spirally, not branched. A weed of ricefields | |

* From echinos = hedgehog, and chlos = grass.

- + Inflorescence branches not spirally arranged
1. *E. crus galli* (L.) Roem. et Schult. var. *mutica* Hack.
 7. Inflorescence very dense, more or less dark purple. Awns to 4.5 cm long. Wild plant 7. *E. caudata* Roshev.
 + Inflorescence of moderate density, green or faintly purple. Awns to 3 mm long. Weed *E. crus galli* (L.) Roem. et Schult. var. *breviaristata* Doll. et var. *longiseta* Doll.

1. *E. crus galli* (L.) Roem. et Schult. Syst. II (1817) 477; Griseb. in Ldb. Fl. Ross. IV, 473. - *Panicum crus galli* L. Sp. pl. (1753) 56. - Shmal'g. Fl. II, 589; Kryl. Fl. Zap. Sib. [Fl. west. Sib.] II, 150. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 29, fig. 1411 et 1412.

Annual. Plant green or somewhat purple-tinged; culm 10-100 cm tall, branching from the base, more or less erect, glabrous; leaves broadly linear, sharply scabrous at the margins; ligule lacking. Inflorescence to 20 cm long, branching, more rarely weakly branching (var. *stagnina* (Host) Griseb. - *Panicum Hostii* M.B.), with sharply scabrous branches; spikelets ovate-pointed, ca. 3 mm long; glumes broadly ovate, with 3 nerves, the first short, the second glume and sterile lemma same as spikelet, the second glume with 5 nerves, the sterile lemma with 7 nerves, blunt (var. *mutica* Hack.), short-awned (var. *breviaristata* Doll), or more or less long-awned (var. *longiseta* Doll); glumes and sterile lemma with stiff hairs along the nerves. Fertile lemma glabrous, lustrous. July-September. (Plate II, Figure 8, a-d).

In weedy and wet places. - European part: all regions (except Dv. - Pech.); Caucasus: all regions; West. Siberia: all regions; East. Siberia: Ang. - Sayan., Daur.; Far East: Ze. - Bur., Ud., Ussur.; Centr. Asia: all regions. Gen. Distr.: hot and temperate zones of both hemispheres, but mainly in northern hemisphere. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. In pasture it is readily eaten by livestock before flowering and in hay. Seeds are used as feed for poultry. In North America it is cultivated as an excellent fodder plant - "Barn-yard-grass," while in the U.S.S.R. it is a troublesome weed, especially in rice-fields and in gardens.

2. *E. frumentacea* (Roxb.) Link. Enum. Hort. Berol. I (1821) 204. - *Panicum frumentaceum* Roxb. Fl. Ind. I (1820) 307. - *Panicum crus galli* var. *frumentaceum* Trin. Cat. Ceyl. Pl. (1885) 104. - Ic.: Fl. Az. Ross. [Fl. As. Russ.] VI (1914) 63, fig. 14. C.

- Annual. Culms 50-120 cm tall, erect, branching from the base, glabrous, smooth. Leaves elongate-lanceolate, to 2 cm broad, glabrous, flat, with sharply scabrous margins; ligule lacking. Inflorescence 6-12 (15) cm long, very dense, with numerous spikelets, with sharply scabrous branches; spikelets ca. 3 mm long, more or less round, only slightly pointed; first glume broadly ovate, 3-nerved, half as long as the spikelet, the second glume and sterile lemma with 5 and 7 nerves, respectively, as long as the spikelet, always awnless, hispidulous; fertile lemma indurate, glabrous, white, lustrous, broadly ovate. August-September.

Cultivated, mainly by Koreans; common weed. - Far East: Ussur. Gen. Distr.: Jap.-Chin. and tropical countries. Described from India. Type in London.

ECONOMIC IMPORTANCE. Mainly used as fodder for horses and mules; among Koreans of the Ussuri Region it is often the main food article (meal).

3. *E. colona* (L.) P.B. Agrost. (1812) 53. - *Panicum colonum* L. Syst. ed. 10 (1759) 870.

Annual. Green, forming a small top; culms 10-30 cm tall, branching, ascending or prostrate, rooting at nodes, glabrous; leaves glabrous, linear, acute, with sharply scabrous margins, often with black transverse bands; ligule lacking. Inflorescence 3-6 (-10) cm long, sparingly branching. Spikelets ovate-pointed, ca. 2 mm long; first glume broadly ovate, 3-nerved, half as long as the spikelet, the second glume and sterile lemma with 5 and 7 nerves respectively, as long as the spikelet; all three awnless, puberulent; fertile lemma indurate, glabrous, lustrous. July-October.

In wet places, often as weed. -Caucasus: East, Transcauc. (Shirvanskaya Steppe). Gen. Distr. Medit., tropical countries. Described from India. Type in London.

ECONOMIC IMPORTANCE. A good fodder plant; often cultivated, especially in India.

4. *E. oryzicola* Vasing. comb. nova. - *Panicum oryzicola* Vasing. Tr. Prikl. Bot., Genet. i Selekt. [Bull. Appl. Bot., Genet. and Plant Breed.] XXV (1931) 125. - *Panicum crus galli* var. *oryzicola* Vasing. in herb. Acad. Sc. USSR.

Annual. Culms 50-150 cm tall, erect, branching at base, glabrous or with pubescent lower nodes; leaves linear-lanceolate, more or less scabrous, to 1 cm broad, flat, with dense hairs at the base of the blade and glabrous (f. *glabra* Vasing.) or appressed-hairy sheaths. (f. *pilosa* Vasing.); ligule lacking. Inflorescence 8-15 cm long, with scabrous branches; spikelets ovate-pointed, about 4-5 mm long; first glume broadly ovate, 3-nerved, half as long as spikelet, the second glume and sterile lemma with 5 and 7 nerves respectively, as long as spikelet, pointed, awnless (var. *mutica* Vasing.) or awned (var. *aristata* Vasing.); fertile lemma indurate, glabrous, lustrous. August-September.

In ricefield, as a weed. -Caucasus: -adventive in ricefields, Ciscauc., East, Transcauc., Tal.; Far East: Ussur.; Centr. Asia: Amu-Dar. Endemic. Type in Leningrad.

NOTE. A species easily distinguishable, even in seedling stage, by the ringlike pubescence at the base of lower leaf blades. The species has
34 appeared in ricefields of the Far East only in recent years and was first mentioned by A. V. Vazinger. It has by now been imported with Far Eastern varieties of rice into the Caucasus and central Asia. It is very strange that it has not so far been reported from Korea or Japan.

ECONOMIC IMPORTANCE. A noxious weed against which a persistent struggle must be pursued.

5. *E. macrocarpa* Vasing. sp. nov. in Addenda p. 739. - *Panicum crus galli* auct. fl. Asiae mediae.

Annual. Light green, glossy plant, forming rather narrow tops; culms 50-150 cm tall, erect, branching, fairly thick, inflated at nodes, 1-20 per top; leaves broadly linear, acuminate, to 1.4 cm broad, with sharply scabrous margins, glabrous, often with sparse long hairs; ligule lacking. Inflorescence 20-25 cm long, drooping, loose, two-sided when young, and at maturity with a spirally shortened axis and therefore with branches sticking out in various directions; branches of panicle unbranched; spikelets 4-4.5 mm long and to 2.5 mm broad, ovate-pointed, arranged in clusters of 3 spikelets on two sides of a triquetrous axis; there are no abortive spikelets;

first glume puberulent, 3-nerved, one-third the length of spikelet, the second stiffly ciliate, broadly lanceolate, as the sterile lemma, pointed, awnless (var. *mutica* Vasing.) or with a rather long awn, 3-5 cm long (var. *aristata* Vasing.) fertile lemma naked, lustrous, plano-convex. Kernels on the panicle ripen simultaneously and remain rather strongly attached to it. August-September.

Occurs only in ricefields. -Caucasus: Ciscauc. (impoted in 1928); Centr. Asia: Upp. Turkm., Amu-Dar., Pam.-Al. Gen. Distr.: Persia. Described from Uzbekistan. Type in Leningrad.

ECONOMIC IMPORTANCE. Suitable as fodder for livestock. Seeds are used for feeding domestic fowl, distillation of alcohol, and also for the making of flour from which flat-cakes are baked. Its market value almost equals that of barley. Yields 3-4 tons per hectare (A. Vazinger).

6. *E. spiralis* Vasing. sp. nov. in Addenda p. 739.

Annual. Light green plant; culms 100-120 cm tall, growing in clusters of 5-10, but unbranched or sparingly branching, erect, glabrous, flattish, smooth, leafy; leaves broadly linear, acuminate, to 1.5 cm broad, smooth, with scabrous margins; ligule lacking; inflorescence 15-18 cm long, dense, compact, with spirally arranged, unbranched or sparsely branching flowering branches, densely beset with spikelets from the very base; rachis stiffly ciliate along the margins; spikelets small, 2.75-3.25 mm long and 1.5 mm broad, awnless, ovate-lanceolate, arranged in pairs, pubescent; first glume broadly ovate, pointed, 1/3 the length of the spikelet, densely covered with 35 hairs, the second glume and sterile lemma 3-5-nerved, as long as spikelet, pointed but awnless, rather strongly covered with bristlelike hairs; fertile lemma naked, lustrous, ovate-pointed, plano-convex. September-October.

Occurs in this country only as a weed of ricefields. -Caucasus: in ricefields, so far only among varieties of Japanese origin (imported in 1931). Gen. Distr.: Japan. Described from northern Caucasus. Type in Leningrad.

ECONOMIC IMPORTANCE. Suitable as a fodder plant; the grain is readily eaten by domestic fowl.

7. *E. caudata* Roshev. in Acta Inst. Bot. Ac. Sc. URSS ser. 1, II (1934). -*E. crus galli* var. *longisetum* Auct. fl. Sib. or. ex parte. -Ic.: Kom. and Alisova. Oprod. rast. Dal'n. Vost. kr. (Identif. Plants of Far Eastern Lands) I (1931) tab. 45.

Annual. Green or faintly purple-tinged plant; culms 50-120 cm tall, branching at base, erect, glabrous, smooth; leaves scabrous, linear up to 1.8 cm broad, with sharply scabrous margins; ligule lacking; panicle to 20 cm long, with stiffly ciliate axis and branches more or less dark purple-tinged; spikelets 2.5-3 mm long, ovate-pointed, always awned; first glume puberulent, broadly ovate, 3-nerved, pointed, 1/3 as long as the spikelet, the second stiffly ciliate, ovate, attenuate into a small awn, as long as the spikelet, the sterile lemma as long as the second glume, but with a long, scabrous awn, to 4.5 cm long; fertile lemma glabrous, lustrous, ovate-pointed, almost as long as the spikelet. July-September.

Along river banks on shoals (not a weed). -East. Siberia: Daur; Far East: Ussur, (common). Endemic. Described from Dauria (floodland of Argun' River, 1931, P. Ovchinnikov). Type in Leningrad.

Genus 88. PANICUM* L.

L. Gen. pl. ed. I (1737) 17.

Inflorescence paniculate, with long branches. Spikelets dorsally flattened, plano-convex, ovate-pointed. Glumes chartaceous, prominently nerved, the first shorter than the second glume and sterile lemma. A palea usually develops in the axil of the third sterile lemma and, like the latter, is associated with an abortive floret. Fertile lemma cartilaginous after flowering. Stamens 3. Stigmas plumose. Kernel free.

1. Spikelets 3.5-4 mm long. First glume with numerous nerves, about 2/3 as long as the spikelet. 1. *P. miliaceum* L.
- + Spikelets 2-3 mm long. First glume not exceeding half the length of the spikelet. 2.
2. First glume one-nerved, 1/2 as long as the spikelet 2. *P. capillare* L.
- 36 + First glume 1-nerved, 1/3 as long as the spikelet 3. *P. acroanthum* Steud.
- ++ First glume 3-5-nerved, 1/3 as long as the spikelet 4. *P. miliare* Lam.

1. *P. miliaceum* L. Sp. pl. (1753) 58; Griseb. in Ldb. Fl. Ross. IV 469; Shmal'g. Fl. II, 589; Kryl. Fl. Zap. Sib. [Fl. West. Sib.] II, 151.

Annual. Culm 20-100 cm tall, simple or branching from the root, hairy or glabrous in upper part; leaves broadly linear and, like the sheaths, more or less hairy; ligule ciliate. Panicle to 20 cm long, spreading (var. *effusum* Alef.) or compressed, drooping, in upper part denser than in the lower (var. *contractum* Alef.), or terminally compressed, erect, equally dense throughout (var. *compactum* Koern.); spikelets ovate-pointed, 3.5-4 mm long; first glume 1/3-1/2 times the length of the spikelet; fertile lemma shorter than glumes, cartilaginous, ovate, glabrous, lustrous, according to variety, whitish, orange-colored, or blackish. June-August. (Plate II, Figure 9 a, b).

In cultivation or as adventive weed in waste places. -European part: every where as adventive plant; in cultivation mainly in the south and southeast; Caucasus: all regions; West, Siberia: all regions; East, Siberia: Ang. -Sayan., Daur.; Far East: Ze. -Bur., Ussur.; Centr. Asia: all regions. Gen. Distr.: hot and temperate zones of both hemispheres, cultivated mainly in Asia. Described from India. Type in London.

AGRICULTURAL IMPORTANCE. This plant is a typical xerophyte which stands up well to intense heat and drought and gives stable, high yields, exceeding the yields of other spring cereals, provided the fields are kept free of weeds (N. Vavilov). The seeds are used for the production of starch. It contains an oil (little studied). Suitable for paper manufacture.

2. *P. capillare* L. Sp. pl. (1753) 26; Griseb. in Ldb. Fl. Ross. IV 470; Shmal'g. Fl. II, 589.

Annual. Culm 40-60 cm tall, branching from the root, more or less hairy; leaves broadly linear-lanceolate and, like the sheaths, densely hairy; ligule short, hairy; panicle diffuse, with long, thin branches; spikelets narrowly lanceolate, ca. 2 mm long; glumes thinly coriaceous, the

* Name applied by Pliny to millet

first ovate, 1-nerved, half the length of the spikelet, the second glume and sterile lemma elongate-lanceolate, with 5 and 3 nerves respectively, of same length as the spikelet; fertile lemma shorter than glumes, cartilaginous, yellow close to the grain. July-September.

As adventive plant or a weed among crops, in gardens, and roadsides. -European part: Mid. Dnep., Low. Don.; West. and East.

Transcauc. Gen. Distr.: N. Am., and as an imported plant in all the countries of the world. Described from Virginia. Type in London.

3. *P.acroanthum* Steud. Syn. gram. I (1855) 87.

Annual. Culm 40-80 cm tall, erect or ascending, often branching from the 37 root, glabrous; leaves linear-lanceolate, to 15 cm long and, like the sheaths, glabrous, with sharply scabrous margins; ligule short, lacerate. Panicle 15-20 cm long, diffuse, with thin upright branches bearing 1-2 (3) spikelets; spikelets ca. 2.5 mm long, ovate-lanceolate, dark purple; the first glume 1-nerved, 1/3 the length of the spikelet; fertile lemma shorter than glumes, glabrous, cartilaginous, lustrous, whitish. July-September.

In swampy meadows, and along streams and roads. -Far East: Ussur. Gen. Distr.: Jap. -Chin., India, and Australia. Described from Japan. Type in Oxford.

4. *P. miliare* Lam. Illustr. I (1791) 46.

Annual. Culm 25-75 cm tall, simple or branched, erect or ascending, glabrous, smooth; leaves linear-lanceolate and, like the sheaths, glabrous or with scattered hairs; ligule short, ciliate; panicle rather dense, erect or drooping, 5-25 cm long, with long, sharply scabrous branches; spikelets ovate-lanceolate, 2.5-3 mm long, green or purple; first glume 3-5-nerved, 1/3 the length of the spikelet, the second 11-13-nerved, the sterile lemma 9-nerved; fertile lemma shorter than glumes, cartilaginous, lustrous. July-September.

In this country a weed among ricefields. -Caucasus: West. and East. Transcauc., Tal. Gen. Distr.: Trop. Asia. Described from India.

Genus 89. OPLISMENUS* P. B.

P. B. Fl. d'Oware II (1807) 14, tab. 58.

Inflorescence an open racemelike panicle. Spikelets arranged on one side of the rachis in aggregates of several together. Glumes hyaline, the sterile lemma often 50, awned; awn of first glume considerably longer than that of the second glume and sterile lemma. Fertile lemma cartilaginous after flowering. Stamens 3. Stigmas plumose.

1. Spikelets arranged in aggregates of 2-6, directly on inflorescence axis 1. *O. undulatifolius* (Ard.) P. B.

+ Spikelets in racemose arrangement on inflorescence branches 2. *O. Burmanni* (Retz.) P. B.

1. *O. undulatifolius* (Ard.) P. B. Agrost. (1812) 54. -*Panicum undulatifolium* Ard. Spec. alt. (1764) 14, tab. 4. -*Orthopogon undulatifolium* Spreng. Syst. I (1825) 306. -*O. Burmanni* M. B.

* From Greek [h]oplismenos - armed, i. e. strongly awned.

Fl. taur. cauc. III (1819) 58; Griseb. in Ldb. Fl. Ross. IV, 474. -IC.: Rchb. Ic. Fl. Germ. I tab., 28 fig., 1409-1410. -Exs. HFR No. 1146.

Perennial. Culms 20-100 cm tall, sparingly branched, prostrate, rooting at nodes, with short internodes, glabrous or more or less pubescent; leaves elongate-lanceolate, to 9 cm long and 2 cm broad, more or less wavy, and, like the sheaths, hairy; ligule ciliate. Inflorescence to 10 cm long, one-sided, with twisted axis; spikelets ca. 4 mm long, ovate-lanceolate, arranged on inflorescence axis in spreading clusters of 2-6; glumes glabrous or hairy: the first with a brown awn 0.6-2 cm long, the second with an awn 3-4 times shorter, the sterile lemma often quite awnless; fertile lemmas white. July-September. (Plate II, Figure 10, a, b, c).

In wet, shady forests and among shrubs. -Caucasus: West. and East. Transcauc., Tal. Gen. Distr.: Medit., Balk. -As. Min., Iran, Ind. -Him. Described from Italy.

2. O. Burmanni (Retz.) P. B. Agrost. (1812) 54. -Panicum Burmanni (Retz. Observ. III (1783) 10. -Ic.: Trin. Sp. gram. icon. II (1828) tab. 193. -Exs.: Amer. Grasses. No. 421.

Annual. Culm 30-50 cm long, branching, prostrate, rooting at nodes, more or less pubescent; leaves lanceolate, to 4 cm long and 1 cm broad, with densely hairy sheaths and blades vested with spreading hairs; ligule ciliate. Inflorescence to 8 cm long, one-sided, with a hairy, twisted axis and short branches, on which the spikelets are crowded racemelike, one-sidedly; spikelets 3.5-4 mm long, ovate-lanceolate, with hairs at the base equaling the spikelet. Glumes ciliate, shorter than the lemmas, long-awned; lemma hairy in upper part, short-awned.

In this country as a weed. -Caucasus: West. Transcauc. (Batum). Gen. Distr.: Tropical countries. Described from India. Type in Sweden, Lund.

NOTE. The plant has appeared in the Caucasus in most recent times, with the introduction of new subtropical crops.

Genus 90. SETARIA* P. B.

P. B. Agrost. (1812) 51.

Inflorescence compact, cylindrical, or somewhat loose and open, elongate. Spikelets short-pedicellate, 1-2-flowered, oval, surrounded by long, scabrous bristles. Glumes hyaline: the first very short, the second longer, the sterile lemma as long as the spikelet, often with a staminate flower. Fertile lemma cartilaginous after flowering, obtuse, smooth or rugose. Stamens 3. Stigmas plumose.

1. Barbs of bristles surrounding the spikelet retrorse; hence bristles tenacious 1. *S. verticillata* (L.) P. B.
- + Barbs of bristles surrounding the spikelet antrorse 2.
2. Fertile lemma distinctly transversely rugose 3.
- + Fertile lemma with indistinct cross-lined wrinkling 4.
3. Spikelets large, ca. 3 mm long; bristles rufous or rubescent 2. *S. glauca* (L.) P. B.

* From Latin seta = bristle

- 39 + Spikelets small, ca. 2mm long, bristles green 3. *S. intermedia* (Roth) Roem. et Schult.
 4. Inflorescence not lobed, to 1 cm broad, compact; inflorescence branches
 not verticillate 4. *S. viridis* (L.) P.B.
 + Inflorescence lobed, 1 1/2-3 cm broad. 5. *S. italica* (L.) P.B.

1. *S. verticillata* (L.) P.B. Agrost. (1812) 51; Griseb. in Ldb. Fl. Ross. IV, 472; Shmal'g. Fl. II, 590. - *Panicum verticillatum* L. Sp. pl. ed. 2 (1762) 82. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 47, fig. 1465.

Annual. Culms 15-60 cm tall, more or less erect, scaberulous below the inflorescence; leaves linear-lanceolate, to 15 cm long, often interrupted near the base; spikelets ca. 2.5 mm long, surrounded by few bristles; bristles retrorsely barbed; the first glume 1/3 as long as the second glume and sterile lemma; fertile lemma with indistinct cross-lined wrinkles. July-August. (Plate II, Figure 13, a).

In wet places. - European part: Mid. Dnep., Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: Ciscauc., Dag., West., East. and South. Transcauc.; Centr. Asia: Aral., Casp., Kyz., -Kum., Kara-Kum., Upp. Turkm., Amur-Dar., Syr-Dar. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk.-As. Min., Ind.-Him. Described from Southern Europe. Type in London.

ECONOMIC IMPORTANCE. Good fodder for livestock in young state; later it coarsens considerably. The seeds are used for food, for feeding poultry, and for distillation of alcohol.

2. *S. glauca* (L.) P.B. Agrost. (1812) 51; Griseb. in Ldb. Fl. Ross. IV, 471; Shmal'g. Fl. II, 590; Kryl. Fl. Zap. Sib. [Fl. West. Sib.] II, 153. - *Panicum glaucum* L. Sp. pl. (1753) 56. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 47, fig. 1466. - Exs.: HFR No. 144.

Annual. Culm 4-50 cm tall, more or less erect, smooth, scaberulous only below the inflorescence; leaves glaucous-green, linear-lanceolate, to 12 mm broad, scaberulous above; ligule short, ciliate. Inflorescence more or less cylindric, to 10 cm long; spikelets ca. 3 mm long and 2 mm broad, with pubescent or rufous bristles, 2-3 times as long as the spikelet, with antrorse barbs; first glume slightly shorter than the second which is half as long as the sterile lemma; fertile lemma always distinctly transversely rugose. June-August. (Table II, Figure 12, a).

Grows along river banks, in sandy soil, but most frequently as a weed - European part: Lad.-Il'm., Upp. Volg., Kam., Upp. Dnep., Centr. Dnep., Volg.-Don., Zavolzh., Prichern., Low. Don., Low. Volg.; Caucasus: Ciscauc., Dag., West., East. and South. Transcauc.; West. Siberia: 40 Irt.; East. Siberia: Ang.-Sayan., Daur.; Far East: Ze.-Bur., Ussur.; Centr. Asia: all regions. Gen. Distr.: hot and temperate zones of both hemisphere. Described from Italy. Type in London.

ECONOMIC IMPORTANCE. In young state it provides good fodder for livestock, especially for sheep; later, after flowering, it coarsens considerably. The seeds are used for food, provide feed for poultry, and are used for distillation of alcohol.

3. *S. intermedia* (Roth) Roem et Schult. Syst. II (1817) 489. - *Panicum intermedium* Roth, Nov. Sp. (1821) 47.

Annual. Culms 20–60 cm tall, more or less ascending, glabrous, smooth; leaves linear-lanceolate, to 8 mm broad, on both sides with dense, spreading hairs; ligule short, densely ciliate. Inflorescence more or less cylindrical, more rarely pyramidal, slightly interrupted, 4–8 cm long, with short, non-verticillate branches; spikelets ca. 2 mm long and 1.25–1.5 mm broad, with greenish bristles 2–3 times as long as the spikelet and bearing antrorse barbs; first glume less than half the length of the spikelet, the second exceeding half the length of the spikelet, the sterile lemma of same length as the spikelet. Fertile lemma always distinctly transversely rugose.

In the U.S.S.R. as a weed. –Caucasus: West, Transcauc. Gen. Distr.: tropical Asia. Described from India. Type in Germany.

NOTE. It has appeared in this country in the most recent years, in tea plantations.

4. *S. viridis* (L.) P. B. Agrost. (1812) 51; Griseb. in Ldb. Fl. Ross. IV, 470; Shmal'g. Fl. II, 590; Kryl. Fl. West. Sib. II, 152. –*Panicum viride* L. Syst. veg. ed. 10 (1759) 870. –*Setaria glareosa* V. Petr. Fl. Jakut. 1 (1930) 118. –*Id.*: Richb. Ic. Fl. Germ. I, tab. 47, fig. 1467. –*Exs.*: H. F. R. No. 400.

Annual. Culm 20–60 cm tall (2.5–6 cm tall in var. *pygmaea* (Asch. u. Gr.) Roshev., 80–100 cm tall in var. *major* Gaud.), more or less erect, more or less scabrous below the inflorescence; leaves green, linear-lanceolate, strongly scabrous on upper surface, weakly on lower surface, with sharply scabrous margins; ligule ciliate; inflorescence dense, cylindrical, to 12 cm long; spikelets elliptic, ca. 2.5 mm long, surrounded by bristles 2–3 times as long as the spikelet; bristles green, more rarely dark purple (var. *Weinmannii* (R. et S.) Roshev. = *Panicum Weinmannii* R. et S. = *Setaria purpurascens* Opitz), with antrorse barbs. Fertile lemma with indistinct cross-lined wrinkles. July–September. (Plate II, Figure 11, a, b, c).

In fields, in weedy places, along stream borders, and on rocky and stony slopes. –European part: all regions; Caucasus: all regions; West. Siberia: all regions; East. Siberia: all regions; Far East: Ze. –Bur., Ussur.; Centr. Asia: all regions. Gen. Distr.: almost all Europe (except the Arctic), temperate part of Asia, and North Africa. Described from southern Europe. Type in London.

Explanation to Table II

1. *Paspalum digitaria* Pers., a) spikelet from dorsal side; b) spikelet from ventral side. –2. *Eriochloa succincta* (Trin.) Kunth., a), b) spikelet from dorsal and ventral side. –3. *E. villosa* (Thbg.) Kunth. a), b) spikelet from dorsal and ventral side. –4. *Digitaria linearis* (Krock.) Crep., a) part of [flowering branch, b), c) spikelet from dorsal and ventral side. –5. *Digitaria sanguinalis* (L.) Scop., part of [flowering branch, a), b) spikelet from dorsal and ventral side. –6. *D. ciliaris* (Retz.) Koel., part of [flowering branch, a) spikelet. –7. *Brachiaria eruciformis* (Sibth.) Griseb.: a) and b) spikelet from dorsal and ventral side. –8. *Echinochloa crus galli* (L.) R. et S., a) and b) spikelet from dorsal and ventral side. –9. *Panicum miliaceum* L., a) and b) spikelet from ventral and dorsal side. –10. *Oplismenus undulatifolius* (Ard.) P. B., a) and b) separate spikelets; c) fertile lemma. –11. *Setaria viridis* (L.) P. B., a) spikelet from ventral and dorsal side; b) same, without glumes; c) bristle. –12. *S. glauca* (L.) P. B., spikelet from dorsal and ventral side; a) same, without glumes. –13. *S. verticillata* (L.) P. B., spikelet from dorsal and ventral side; a) bristle. –14. *S. italica* (L.) P. B. var. *longisetula* Doll., a) bristle; b) spikelet without glumes, from dorsal and ventral side. –15. *S. italica* (L.) P. B. var. *germanica* (P. B.) Richt., a) spikelet without glumes. –16. *Pennisetum flaccidum* Griseb., spikelet with bristles. –17. *P. orientale* Rich., spikelet with bristles; a) spikelet without bristles; b) individual bristle.



ECONOMIC IMPORTANCE. Good fodder for cattle in young state, but after flowering it coarsens considerably and actually becomes injurious, as the bristles surrounding the spikelets become stiff and brittle to such an extent that they produce injuries of the mucous membranes of the mouth. The seeds are edible and are also used for feeding domestic fowl and for distillation of alcohol. It sometimes causes much damage to cotton plantations, as its seeds contaminate the fibers.

5. *S. italica* (L.) P.B. Agrost. (1812) 51; Griseb. in Ldb. Fl. Ross. Iv, 590; Shmal'g. Fl. II, 590; Kryl. Fl. Zap. Sib. [Fl. West. Sib.] II, 154. -*Panicum italicum* L. Sp. pl. (1753) 56. -Ic.; Fl. Az. Ross. [Fl. As. Russ.], No. VI (1914) Fig. 17.

Annual. Culms 50-100 cm tall, more or less erect, scabrous below the inflorescence; leaves to 1.5 cm broad, strongly scabrous on both sides; ligule short, ciliate. Inflorescence 20-25 cm long and 4 cm broad, lobed, drooping at the top; spikelets 2.5-3 mm long, ovate, surrounded by bristles hardly exceeding the length of the spikelets (var. *germanica* (P.B.) Richt. -*S. germanica* P.B.) or 2-4 times as long as the spikelets (var. *longisetula* Doll.). Bristles often yellowish or purple, with antrorse barbs; fertile lemma cartilaginous, with indistinct cross-lined wrinkles. July-September. (Plate II, Figure 14, a, b, and 15, a).

Occurs only in cultivation, or escaped, as a weed. -European part: Upp. Dnep., Mid. Dnep., Volg. -Don., Zavolzh. Caucasus: Ciscauc., West. and East. Transcauc., Tal.; West. Siberia: Irt.; East. Siberia: Daur.; Far East: Ze. -Bur., Ussur.; Centr. Asia: all regions. Gen. Distr.: in all countries of the subtropical and temperate zones. Described from India. Type in London.

ECONOMIC IMPORTANCE. It has the same uses as millet. It is employed in the brewing of beer. It gives 50 centners of hay per hectare and 44 a considerable quantity of grain. In the green state it is readily eaten by horses and cattle. The stems are occasionally poisonous, as they contain a daphnin like glucoside.

S. verticillata P.B. $\times$ *viridis* P.B. in Loyd Fl. de l'Ouest, ed. 4, p. 393. -*Setaria ambigua* Guss. Fl. Sic. syn. (1842) 114. -*Setaria verticillata* β *ambigua* Guss., Prodr. Fl. Sic. (1827) 80. -*Setaria viridis* γ *ambigua* Beck, Fl. Nied. Oesterr. I (1890) 46.

Annual. Culm 15-60 cm tall, more or less erect, scabrous below the inflorescence. Leaves linear-lanceolate, 4-8 mm broad, rather sharply scabrous; ligule short, ciliate; inflorescence cylindrical, 4-10 cm long, interrupted near the base. Spikelets 2-2.5 mm long, ovate, surrounded by bristles slightly exceeding the spikelet; bristles with antrorse barbs; fertile lemma cartilaginous, with indistinct cross-lined wrinkles. July-August.

In fields and in wet places. -European part: Upp. Dnep., Mid. Dnep. Crimea. Gen. Distr.: Medit., Atl. Eur. Described from Sicily. Type in Naples.

NOTE. The hybrid origin of this plant (*S. ambigua* Guss.) was confirmed by Loyd's sowing experiments (see Husnot, Gramineae, p. 9, 1896-99). In external appearance and in various characteristics this species approaches *S. verticillata* or *S. viridis*.

Genus 91. PENNISETUM* RICH.

Rich. in Pers. Syn. I (1805) 72.

Inflorescence racemose or spike-like. Spikelets short-pedicles, 1-2-flowered, surrounded by scabrous or plumose bristles which at maturity fall attached to spikelets. Glumes hyaline, the first short or lacking. Fertile lemma cartilaginous after flowering. Stamens 3. Stigmas plumose.

1. Rachis naked. Bristles surrounding the spikelet simple, scabrous 1. *P. flaccidum* Griseb.
+ Rachis pubescent. Bristles surrounding the spikelet plumose 2. *P. orientale* Rich.

1. *P. flaccidum* Griseb. in Goett. Nachr. (1868) 86. -*Gymnothrix flaccida* Munro ex Aitchis. Cat. Panjab. Pl., p. 163. -*Pennisetum mongolicum* Franch. in herb.

Perennial. Culm 15-80 cm tall, more or less erect, branching at base; leaves elongate-linear, to 8 mm broad, more or less flat, scabrous on upper surface; ligule ciliate; inflorescence 5-15 cm long and to 12 mm broad, spike-like, somewhat drooping, with naked rachis; spikelets lanceolate, ca. 4 mm long, short-pedicellate, with one perfect (rarely staminate) or with a second staminate floret under the perfect; every 2-3(-5) spikelets surrounded by long, scabrous bristles, nearly twice as long as the spikelets. Glumes hyaline; fertile lemma cartilaginous, awnless. June-August. (Plate II, Figure 16).

Along river banks, in meadows, and by roadsides in sandy soil. -Centr. Asia: Pam. -Al. Gen. Distr.: Iran, Ind. -Him., Dzung. -Kashg., Mong. Described from North India. Type in London.

2. *P. orientale* Rich. in Pers. Syn. I (1805) 72; Griseb. in Ldb. Fl. Ross. IV (1853) 472. -*Pennisetum fasciculatum* Trin. in Mem. Acad. Petersb. ser. 6, III, 2 (1835) 181. -Exs.: Herb. Fl. Cauc. No. 310.

Perennial. Culm 20-120 cm tall, ascending, branching at base; leaves narrowly linear, scaberulous, more or less twisted; ligule ciliate; inflorescence 7-20 cm long and to 1.5 cm broad, spike-like, somewhat drooping; spikelets lanceolate, ca. 6 mm long, short-pedicled, with one perfect, or with an additional staminate floret below the perfect; every 2-5 spikelets surrounded by long plumose bristles, 1.5-2 times as long as the spikelet; glumes hyaline; lemmas cartilaginous, lemma short-awned. April-May. (Plate II, Figure 17, a, b).

In foothills, on rocks and dry slopes. -Centr. Asia: Kara-Kum., Upp. Turkm.; Caucasus: West., East., and South. Transcauc. Gen. Distr.: East. Medit., Balk. -As. Min., Arm. -Kurd., Iran, Ind. -Him. Described from the East.

ECONOMIC IMPORTANCE. Grain used for distillation of vodka. An inferior forage plant.

* From Latin *penna* - feather, and *seta* - bristle.

TRIBE VI.-ORYZAE KUNTH.

Kunth, in Mém. Mus. Paris. II (1815) 74.

Spikelets 1-flowered, perfect or unisexual, laterally compressed. Glumes reduced or lacking. Stamens mostly 6, more rarely 3. Hilum linear.

Analytical Key to Genera

1. Spikelets with unisexual florets; plant monoecious; staminate and pistillate spikelets in different parts of the same inflorescence 92. *Zizania* L.
- + Spikelets with perfect florets 2.
2. Glumes reduced *Oryza* L.
- + Glumes lacking 93. *Leersia* Sw.

Genus 92. ZIZANIA* L.

L. Sp. pl. (1753) 991 (nomen); gen. pl., ed. 5 (1754) 427.

Inflorescence large, contracted and bearing pistillate spikelets in upper 46 part, spreading and bearing staminate spikelets in the lower part. Spikelets 1-flowered: staminate spikelets lanceolate, awnless or short-awned, pistillate spikelets almost linear, tapering into a long awn. Glumes reduced. Lemmas thin-coriaceous. Stamens 6, connate at base. Stigmas plumose.

1. Annual plant with fibrous roots. Culms 0.5-1 cm in diameter, minutely pubescent at the nodes. Pistillate spikelets with awn exceeding the lemma and palea 5-6 times 1. *Z. aquatica* L.
- + Perennial plant. Rhizomes long, to 60 cm, thick, hollow, with partitions at the nodes. Culms 1-2 cm in diameter. Pistillate spikelets with awn only slightly exceeding the lemma and palea. 2. *Z. latifolia* Turcz.

1. *Z. aquatica* L. Sp. pl. (1753) 991.

Annual. Roots fibrous, coarse, often arising from the lower nodes, submerged in water; culms 150-200 cm tall, branching, glabrous, minutely pubescent only at the nodes, to 1 cm in diameter; leaves linear-lanceolate, 0.5-1.5 cm broad, glabrous, with sharply scabrous margins; ligule to 8 mm long. Inflorescence to 40 cm long, with branches spreading in lower part and appressed in upper part; staminate spikelets ca. 1 cm long and 1-2 mm broad, narrow-lanceolate, purple-tinged at the tip; pistillate spikelets ca. 1.5-2 mm broad, yellowish, with sharply scabrous awn to 8 cm long. Caryopsis linear, ca. 1.5 cm long and 1 mm in thickness. July-August.

Borders of ponds. -Europ. part: Lad. -U'm. Occurring only in Leningrad Oblast', in Krasnogvardeiskii Raion, by Vyal'e Lake, where it was shown by students of the Academy of Forest Technology. Gen. Distr.: North America. Described from Virginia (North America). Type in London

* From Greek *Zizanon*-an old name for a weed.

In western Europe it is sown here and there around ponds as food for fish and as an ornamental plant, but it remains alive for only a few years, and then dies out.

ECONOMIC IMPORTANCE. In North America this *Zizania* is known as Canadian, wild, or water rice. The grain is gathered in large quantities by Indians who regard it as very nutritious and tasty. The bases of culms are used as a vegetable, while culms and leaves are considered as outstanding fodder for livestock. This plant is of such importance to North American Indians that they propagate it by sowing in those reservoirs in which it has not been present. In recent time wild rice is also grown at the borders of lakes as food for fish which readily eat its seeds. The great importance attached to this plant in America fully justifies the assumption that within a short time it will also receive attention in the U.S.S.R., and will attain wide distribution and use.

2. *Z. latifolia* Turcz. Cat. Baic. -dah. in Bull. Mosc. 1838, p. 105, No 1337. -*Zizania aquatica* var. *latifolia* Kom. Fl. Mansh. I. in A. H. P. XX (1901) 261. -*Hydropyrum latifolium* Griseb. in Ldb. Fl. Ross. IV (1853) 466.

Perennial. Rhizome to 60 cm long and 1 cm thick, hollow, with partitions
47 at the nodes and adventitious roots; roots fibrous, coarse, often arising also at the lower, submerged nodes; culms more or less erect, 200-300 cm tall, glabrous (also at the nodes), to 2 cm in diameter, unbranched or weakly branching; leaves linear-lanceolate, 1.5-2.5 cm broad, scabrous above. Inflorescence to 55 cm long, contracted in upper part, spreading in lower part; staminate spikelets ca. 1 cm long, lanceolate, rubescent at the apex; pistillate spikelets ca. 1.5-1.8 cm long and 1.5 cm broad, greenish, long-awned; caryopsis cylindrical, ca. 1.5 cm long. July-August. (Plate III, Figure 1, a, b).

Grows at the borders of lakes, in still-water bays, and along slow-running streams. -East Siberia: Daur.; Far East: Ze. -Bur., Ussur., Gen. Distr.: Jap. -Chin. Described from Zabaikal'e [Transbaikal region]. Type in Leningrad.

ECONOMIC IMPORTANCE. The culms, rhizomes, and fruits of *Zizania* have long been considered in North and South China as useful and nutritious products. Young shoots, which have a pleasant sweet taste, as well as culm bases, are used for food. Fully developed culms, rhizomes, and grain, are eaten in famine years. In China this plant is cultivated here and there as a food plant and as excellent fodder for horses. In Chinese medicine, the culms, grain, and roots of this plant are used against anaemia and fever, against heart, kidney, and liver diseases, for application to burns, and as a diuretic.

Genus ORYZA* L.

L. Gen. pl. (1737) 105.

Inflorescence a large, rather open panicle. Spikelets laterally compressed, 1-flowered, perfect. Glumes much reduced; lemma and palea indurated.

* Name for rice, given by Theophrastus.

coriaceous, lemma 5-nerved, often awned, palea 3-nerved, always awnless. Stamens 6. Stigmas plumose.

1. *O. sativa* L. Sp. pl. (1753) 333

Annual. Culm 50-150 cm tall, branching at base; roots fibrous; leaves linear, to 50 cm long and 1 cm broad, more or less smooth; ligule 2-3 cm long, usually with falcate auricles; panicle to 20 cm long, more or less drooping; spikelets ca. 9 mm long and 4 mm broad, oblong; glumes narrow-lanceolate, ca. 3 mm long; lemma and palea densely covered with cross-wise-arranged rows of papillae and scattered hard hairs. Palea often awned. June-August. (Plate III, Figure 2, a).

Cultivated mainly in flooded fields, as it requires very large quantities of water for normal development. -Europ. part: Low. Volg. (trial plantings); Caucasus: Dag., East. and South. Transcauc., Tal., Far East: Ze. -Bur. (around Blagoveshchensk), Ussur.; Centr. Asia: Pribalkh., Kyz. -Kum., Upp. Turkm., Amu-Dar., Syr-Dar., Pam. -Al. Gen. Distr.: cultivated in all tropical and subtropical countries and in Southern Europe. Described from India. Type in London.

48 ECONOMIC IMPORTANCE. Of all spring cereals, rice is about the most important, since it surpasses almost twofold the yields of other cereals.

As the rice crop calls for much heat and large quantities of water, its cultivation is confined at present in this country to the southernmost regions. However, the studies conducted in recent years at the All-Union Agricultural Academy im. Lenin have solved the problem of production of early varieties with satisfactory yields combined with high quality grain. Consequently, this valuable crop plant will move up considerably to the north in the near future.

Apart from the use of rice grain for meal and the use of the plant as cereal, it is used for the preparation of starch, it is employed as admixture in brewing of beer, and in the East it is used for the making of an alcoholic beverage - "sake" and "arak". The husks of the grain obtained from hulling provide a good feed for livestock. Rice straw also serves as feed for livestock and is used in the manufacture of straw hats and various kinds of weaving, and for the making of paper pulp.

Genus 93. LEERSIA* SW.

Sw. Prodr. veg. Ind. occ. (1788) 21.

Inflorescence paniculate, with slender, spreading branches. Spikelets laterally compressed, 1-flowered, perfect. Glumes lacking. Lemma and palea about equal, coriaceous. Stamens 3, rarely 1-6. Stigmas plumose.

1. *L. oryzoides* (L.) Swartz. Fl. Ind. occ. I (1797) 132. -Griseb. in Ldb. Fl. Ross. IV, 466; Shmal'g. Fl. II, 591; Kryl. Fl. Zap. Sib. [Fl. West. Sib.] II, 154. -*Phalaris oryzoides* L. Sp. pl. (1753) 55. -*Oryza clandestina* A. Br. ex Asch. Fl. Prov. Brandb. 1864) 799. -Ic.: Rchb. Ic. Fl. Germ. I (1843) tab. 52, fig. 1495. -Exs.: HFR no 92.

* Named after the pharmacist J. D. Leers, who lived in the 18th century and wrote a flora of Herborn (Flora Herbornensis, 1775).

Perennial. Creeping rhizomes; culms 100-150 cm tall, branching at base, pubescent at the nodes; leaves linear, to 8 mm broad, sharply scabrous at the margins; ligule short. Panicle open, often enveloped by the sheath of the upper leaf; spikelets elliptical, 4-5 mm long, whitish, with green nerves; lemma short-acuminate, 5-nerved, keeled, bristly ciliate on the back and on the margins; palea also ciliate on the nerves. July-August. (Plate III, Figure 3, a).

Grows along borders of streams and lakes and in backwaters. -Europ. part: Lad. -Il'm., Upp. Volg., Upp. Dnep., Volg. -Don., Zavolzh., Prichern., Low. Don., Low. Volg.; Caucasus: Ciscauc., West. and East. Transcauc.; Centr. Asia: Syr-Dar., Pam. -Al.; Far East: Ussur. Gen. Distr.: Scand., Centr. and Atl. Eur., Medit., Balk. -As. Min., Arm. -Kurd., Jap. -Chin. Described from Italy. Type in London.

ECONOMIC IMPORTANCE. Suitable as fodder, but it occurs in small amount and rather rarely.

TRIBE VII. PHALARIDAE LINK.

Link Hort. berol. 1 (1827) 62 ex parte; Benth. et Hook. Gen. III (1883) 1083.

Spikelets with 2 glumes and 2 sterile lemmas. The sterile lemmas are sometimes reduced and consist of small scales, and then the spikelet is 1-flowered, or else the sterile lemmas are well developed, and then staminate florets develop in their axils and the spikelets are 2-3-flowered.

Analytical Key to Genera

1. Both sterile lemmas or only the lower one with staminate florets in their axils, as long or about as long as the glumes. 97. *Hierochloa* R. Br.
- + Both sterile lemmas without florets in their axils, much shorter than the glumes. 2.
2. Sterile lemmas small, not scalelike, awned from the back. 96. *Anthoxanthum* L.
- + Sterile lemmas scalelike, awnless. 3.
3. Inflorescence spikelike. Glumes broad-winged on the keel. 94. *Phalaris* L.
- + Inflorescence lobed or paniculate. Glumes not winged on the keel, or with a very narrow wing. 95. *Digraphis* Trin.

Genus 94. PHALARIS* L.

L. Gen. pl. ed. 1 (1737) 14.

Inflorescence dense, spikelike. Spikelets 1-flowered, perfect, laterally compressed. Glumes longer than the floret, with a rather broad-winged keel; sterile lemmas small or represented by insignificant scales, and one

* Name applied by Dioscorides and Pliny to some cereal.

of them sometimes obsolete. Lemmas indurate-coriaceous, smooth, lustrous. Stamens 3. Stigmas plumose.

1. Perennials 2.
- + Annuals 3.
- 52 2. The lower internodes of the culms tuberously thickened. Glumes acute. Sterile lemma solitary, attaining about 1/3 of the length of the lemmas. 1. *Ph. bulbosa* L.
- + The lower internodes without tuberlike thickenings. Glumes obtusely beaked at the summit. Sterile lemmas two, short, 0.5-0.8 mm long. 2. *Ph. truncata* Guss.
3. Spikelets arranged in groups of 7. The central spikelet perfect, the other six sterile, abortive. Spikelets in lower part of inflorescence differ conspicuously from the more terminal spikelets in being distinctly abortive. 6. *Ph. paradoxa* L.
- + All spikelets alike, the fertile ones not arranged in groups of 7. Inflorescence uniform throughout its length, or with only a few abortive spikelets at base. 4.
4. Wing on the back of glumes with fringed-toothed margin. Only one of the sterile lemmas developed, attaining 1.5 mm in length. 4. *Ph. minor* Retz.
- + Wing on the back of glumes with entire or slightly undulate margin. Sterile lemmas always two. 5.
5. Sterile lemmas 3-4 mm long 3. *Ph. canariensis* L.
6. Sterile lemmas ca. 0.8 mm long 5. *Ph. brachystachys* Link.

1. *Ph. bulbosa* L. Cent. Pl. rar. I (1755) 4. - *Ph. nodosa* L. Syst. veg. ed. 13 (1774) 88; Griseb. in Ldb. Fl. Ross. IV, 455; Shmal'g. Fl. II, 592. - *Phalaris tuberosa* L. Mant. II (1771) 557.

Perennial. Culms 50-100 cm tall, tuberously thickened at base, smooth or scaberulous; leaves to 8 mm broad, more or less scabrous, partly folded; ligule 3-5 mm long. Inflorescence 3-10 cm long and 1-2 cm broad, compact, cylindrical or oblong; spikelets ca. 5 mm long; glumes 4.5-5.5 mm long, lanceolate, with a broad, entire wing; sterile lemma solitary, narrowly lanceolate, glabrous, 1/3 as long as fertile lemma; fertile lemma ca. 3.5 mm long, pubescent, broadly lanceolate, acute. April-July. (Plate IV, Figure 1, a, b).

Meadows, field borders and roadsides. -Caucasus: Dag., Tal. Gen. Distr.: Medit., Canary Islands. Described from Eastern Mediterranean. Type in London.

ECONOMIC IMPORTANCE. A good fodder plant in young state.

2. *Ph. truncata* Guss. Fl. Sic. Prodr. Suppl. (1832) 18. - *Phalaris aquatica* Desf. Fl. Atl. I (1798) 56 (non L.)

- Perennial. Rhizome short; culms 50-100 cm tall, more or less ascending, leafy, more or less smooth; leaves to 6 mm broad, more or less flat, scaberulous; ligule 3-7 mm long. Inflorescence 3-10 cm long and 1-2 cm broad, oblong-cylindrical; spikelets oblong-ovoid, ca. 6 mm long; glumes 5-6.5 mm long, obtusely beaked at the summit and with a broad, entire wing;
- 53 sterile lemmas 2, lanceolate, 0.5-0.8 mm long, hairy at base; fertile lemma ca. 3.5 mm long, pubescent, broadly lanceolate, acute. Caryopsis ca. 3-3.5 mm long. May-June. (Plate IV, Figure 2, a).

Weed-infested places, sometimes on clay. -Caucasus: Tal. Gen. Distr.: Medit. Described from Sicily. Type in Naples.

3. *Ph. canariensis* L. Sp. pl. (1753) 54. -Griseb. in Ldb. Fl. Ross. IV, 454; Shmal'g. Fl. II, 592. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 52, fig. 1942.

Annual. Culms 20-60 cm tall, more or less erect, usually branching at base; sheath of terminal leaf inflated; leaves to 7 mm broad, sharply retrorsely scabrous; ligule 3-4 mm long. Inflorescence 3-4 cm long, ovoid, rarely oblong; spikelets ovoid, 5-9 mm long; glumes 7-8 mm long, lanceolate, whitish, with a green longitudinal stripe and a broad, entire wing; lemmas narrowly lanceolate, ca. 3 mm long, without a keel, pubescent; fertile lemma 5-6 mm long, pubescent, lance-acuminate; caryopsis ca. 3 mm long. June-September. (Plate IV, Figure 3, a, b).

In fields and gardens, along roadsides and river banks, often as a weed or adventive. -European part: Dv. -Pech., Lad. -Il'm., Upp. Volg., Upp. Dnep., Mid. Dnep., Volg. -Don., Prichern., Crimea, Low. Volg.; Caucasus: in all regions, escaped; West. Siberia: Ob. (adventive). Gen. Distr.: West. Mediterranean, but as adventive plant in nearly all countries of the temperate zones. Described from Canary Islands. Type in London.

ECONOMIC IMPORTANCE. This plant furnishes the widely known canary seed which is used as feed for canaries, hence the genus *Phalaris* derives its name Kanarechnik; it also finds application in technology (in the textile industry for sizing), more rarely used for human consumption. Cultivated in small amounts in all countries of southern and partly of central Europe; often turns wild. Of importance as an export article.

NOTE. As already indicated by Koernicke, the Iberian Peninsula is to be regarded as the homeland of *Ph. canariensis*, and not Canary Islands, where it is an importation, like all over southern Europe.

4. *Ph. minor* Retz. Obs. III (1783) 8; Griseb. in Ldb. Fl. Ross. IV, 592; Shmal'g. Fl. II, 592.

Annual. Culms 40-80 (-100) cm tall (20-30 cm - var. *gracilis* Parl.), often branching at base, smooth; leaves to 7 mm broad, more or less scabrous; ligule 3-7 mm long. Inflorescence to 5 cm long and 2 cm broad, ovoid or oblong. Spikelets broadly lanceolate, on short pedicels; glumes ca. 5 mm long, short-pointed, whitish, with a green longitudinal stripe and a broad wing, fringed-toothed at the margin; sterile lemma solitary, narrowly lanceolate, ca. 1.5 mm long; fertile lemma and palea ca. 3 mm long, more or less lustrous, indurate, grayish. April-July. (Plate IV, Figure 4, a).

54 Water meadows, gardens, and fields. -European part: recorded for Crimea; Caucasus: East. Transcauc.; Centr. Asia: Kara-Kum., Upp. Turkm. Gen. Distr.: Medit., Balk. -As. Min., Arm. -Kurd., Iran, Ind. -Him. Described from India. Type in Sweden.

ECONOMIC IMPORTANCE. A good fodder plant; cultivated here and there.

5. *Ph. brachystachys* Link. in Schrad. Neues Journ. I, 3 (1806) 134. -*Phalaris canariensis* var. *brachystachys* Grossh. Fl. Kavk. (Fl. Cauc.) I (1928) 62.

Annual. Culms 20-100 cm tall, more or less erect, sometimes branching at base; leaves to 8 mm broad, retrorsely scabrous; ligule to 5 mm long. Inflorescence 1-3 cm long, ovoid or oblong; spikelets oblong-ovate, ca. 7 mm long; glumes 6-7.5 mm long, short-pointed, with a broad, entire keel; sterile lemmas 2, equal, lanceolate, ca. 0.8 mm long, glabrous, with hairs at base; fertile lemma ca. 5 mm long, lustrous, pubescent, broad-

ly lanceolate, acuminate. Caryopsis ca 4.5 mm long. April-July. (Plate IV, Figure 5, a).

Fields, meadows, and ditches. -Caucasus: East. Transcauc. (Mugan'). Gen. Distr.: Medit. Described from Portugal.

6. *Ph. paradoxa* L. Sp. pl. ed. 2, II (1763) 1665. -Lc.: Rchb. Ic. Fl. Germ. I, tab. 52, fig. 1491.

Annual. Culms 30-50 cm tall, often tufted, smooth, more or less scabrous only below the inflorescence; sheath of terminal leaf inflated, more or less enveloping the inflorescence. Leaves 2-8 mm broad, flat or more or less folded, scabrous; ligule 3-6 mm long. Inflorescence 2-5 (-8) cm long and to 2 cm broad, cylindrical or club-shaped; spikelets arranged in groups of 7, the central spikelet fertile, the lateral ones sterile or more or less abortive. After seed ripening the spikelets fall from inflorescence in groups of seven; glumes with a point to 8 mm long and a winglike tooth; sterile lemmas very short, often obsolete. Fertile lemma 3-4 mm long, lance-ovate, indurate-coriaceous, lustrous, white. Caryopsis ca. 3 mm long, dark brown. In addition to spikelets described above, the lower part of the spike contains a varying number of entirely abortive, wrinkled, clavate spikelets. April-June. (Plate IV, Figure 6, a, b, c).

In meadows and gardens, river banks along, and as a weed. -Caucasus: East. Transcauc. -Shirvan District. Gen. Distr.: Medit. Described from Eastern Mediterranean. Type in London.

Genus 95. DIGRAPHIS* TRIN.

Trin., Fund. agrost. (1820) 127 (nomen conservandum). -Typhoides Moench, Meth. (1794) 201. -
Baldingera Gaertn. Fl. Wett. I (1799) 43.

Inflorescence terminal, dense, more or less lobed, or, more rarely, somewhat branching, paniculate. Spikelets 1-flowered, perfect, laterally compressed. Glumes longer than the floret, with a wingless or narrow-winged keel; sterile lemmas always two, narrow-linear, hairy. Lemmas indurate-coriaceous, smooth, lustrous. Stamens 3. Stigmas plumose.

D. arundinacea (L.) Trin. Fund. Agrost. (1820) 127; Griseb. in Kdb. Ross. IV, 454; Fl. Zap. Sib. (Fl. West. Sib.) II, 155. -*Phalaris arundinacea* L. Sp. pl. (1753) 55; Shmal'g. Fl. II, 591. -*Baldingera colorata* Gaertn. Fl. Wett. I (1799) 96. -*B. arundinacea* Dumort. Obs. Gram. (1823) 130. -Lc.: Rchb. Ic. Fl. Germ. I, tab. 52, fig. 149 R. (sub *Phalaris*). -Exs.: HFR No. 398.

Perennial. Long underground rhizomes. Culms 50-200 cm tall, leafy, smooth; leaves to 18 mm broad, sharply scabrous on the margins and on the lower surface, green or with longitudinal yellow hairs (var. *picta* L.); ligule to 6 mm long. Panicle 8-20 cm long, lobed or almost spikelike, compact (var. *japonica* Hack.), greenish or rubescent; spikelets short-pedicelled, lanceolate, 4-5 mm long; glumes 4-5 mm long, oblong-lanceolate.

* From Greek *di* - double, and *graphis* - raceme.

Explanation to Plate III

1. *Zizania latifolia* Turcz., a) and b) Pistillate and staminate spikelets. - 2. *Oryza sativa* L., a) spikelet. - 3. *Leersia oryzoides* (L.) Sw., a) spikelet.



acute, 3-nerved, with a dorsal keel, sometimes slightly winged; sterile lemmas ca. 1 mm long, linear, hairy; fertile lemma and palea ca. 3 mm long, indurate-coriaceous, lustrous, hairy in upper part; caryopsis ca. 2 mm long. June-August. (Plate IV, Figure 7, a, b).

River banks and water meadows. Arctic: Arct. Eur. (Murman); European part: all regions; Caucasus: Ciscauc., West., East. and South Transcauc.; West. Siberia: all regions; East. Siberia: all regions; Far East: all regions; Centr. Asia: all regions (except Kara-Kum). Gen. Distr.: Nearly all Europe (except extreme south), Balk.-As. Min., Arm.-Kurd., Iran, Dzung.-Kashg., Jap.-Chin., N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. A plant deserving attention for introduction into cultivation. Develops early in spring and furnishes good fodder; later becomes very coarse, and should therefore be cut towards the end of heading. Seed yield up to 40-60 centners. If cut or grazed young, it produces much aftergrowth. Does not fear wetness and is not exacting as regards soil, stands up even to prolonged flooding (as well as shading), but avoids peat and stagnant water on the surface. It develops best in water meadows, where it sometimes forms almost pure stands. A tall-growing grass. Together with *Calamagrostis Langsdorffii* Trin. it is one of the most important haymaking grasses in northern regions.

Genus 96. ANTHOXANTHUM* L.

L. Gen. pl. ed. I (1737) 18.

Inflorescence dense, spikelike. Spikelets lanceolate, 1-flowered, perfect. Lower glume pointed, 1-nerved, the upper glume twice as long, 3-
56 nerved; sterile lemmas much shorter than the upper glume, bifid at the summit, awned. Lemma and palea 1-nerved, hyaline, obtuse. Stamens 2. Stigmas plumose.

1. Perennial plant. Culms unbranched or weakly branching. Spikelets with rather inconspicuous awns. 1. *A. odoratum* L.
2. Annual plant. Culms strongly bushy branching. Spikelets always with protruding, prominent awns. 2. *A. aristatum* Boiss.

1. *A. odoratum* L. Sp. pl. (1753) 28; Griseb. in Ldb. Fl. Ross. IV, 408; Shmal'g. Fl. II, 592; Kryl. Fl. Zap. Sib. [Fl. West. Sib.] II, 156; Kolokol'nikov in Journal Soc. Bot. de Russie 1931, 191-196. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 106, fig. 1723, 1724. -Exs.: HFR No 696.

Perennial. Tufted; culms 10-50 cm tall, glabrous, smooth. Leaf sheaths glabrous (var. *glabrescens* Cel., var. *glabrivaginatatum* Kolokoln., var. *pseudociliatum* Kolokoln.) or more or less pubescent (var. *glabripaleatum* Kolokoln., var. *Fokinii* Kolokoln.). Leaves linear, to 5 mm broad, glabrous (var. *glabrescens* Celak., var. *pseudociliatum* Kolokoln.), or ciliate-pubescent on the margin (var. *glabrivaginatatum* Kolokoln., var. *glabripaleatum* Kolokoln., var. *ciliatum*

* From Greek *anthos* - flower, and *xanthos* - yellow.

(Westb.) Kolokoln., var. *Fokinii* Kolokoln.) ligule to 2 mm long. Inflorescence 3-5 cm long and to 1 cm broad, spike-like, more rarely with lower branches to 2-3 cm long (f. *ramosum* Roshev.) spikelets to 7 mm long, yellowish-green or brownish; lower glumes lance-acuminate, glabrous (var. *glabrescens* Celak., var. *glabrivaginatatum* Kolokoln., var. *glabripaleatum* Kolokoln.) or pubescent (var. *pseudociliatum* Kolokoln., var. *ciliatum* (Westb.) Kolokoln., var. *Fokinii* Kolokoln.); sterile lemmas pubescent, ca. 3 mm long, the lower one with a geniculate awn 7-10 mm long, the upper one with a straight awn 3-4 mm long; fertile lemma and palea ca. 2 mm long, membranaceous. May-August. (Plate IV, Figure 8, a).

Hillocks and meadows. - Arctic: Arct. Eur. (Kolguev Island); European part: Kar. -Lap., Dv. -Pech., Lad. -Il'm., Upp. Volg., Upp. Dnep., Mid. Dnep., Volg. -Don., Zavolzh., Low. Don., Low. Volg.; Caucasus: Ciscauc., Dag., West., East., and South. Transcauc.; West. Siberia: all regions; East. Siberia: all regions; Centr. Asia: Aral -Casp., Pribalkh., Dzung. -Tarb. Gen. Distr.: Scand., Centr. Eur., Atl. Eur., Medit., Balk. -As. Min., N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. It awakens very early in spring and flowers early. In young state it is readily eaten by livestock, but on account of its insignificant size it is of no importance as a fodder plant; it is often sown in mixture with other grasses, as it imparts a pleasant odor to the hay due to the content of a distinctive substance, coumarin ($C_9H_6O_2$). Certain animals, including cows, dislike this odor. A low-growing grass. It is used as an admixture to snuff and smoking tobacco.

2. *A. aristatum* Boiss. Voy. Esp. II (1845) 638. - *Anthoxanthum Puelii* Lecoq et Lamotte, Cat. pl. plat. centr. France (1847) 385. - Exs.: Kneucker, Gram. exs. No 619.

Annual. Culms 4-40 cm tall, branching at base, more or less erect, glabrous; leaves linear-acuminate, to 3 mm broad, more or less hairy. Leaf sheaths hairy or the lower ones glabrescent; ligule to 3 mm long; inflorescence 1-5 cm long and to 2 cm broad, spike-like, cylindrical or ovoid; spikelets 5-8 mm long, more or less golden-green; glumes lance-acuminate with a distinct prickly point, unequal; sterile lemmas with hairs ca. 3 mm long; the awn of the lower sterile lemma ca. 18-20 mm long, geniculate, the awn of the upper one somewhat flexuous, ca. 5 mm long. Lemma and palea ca. 1.5 mm long, hyaline. May-August. (Plate IV, Figure 9, a).

Grass-covered, predominantly sandy places. - European part: recorded for the north-west of the European part of RSFSR (importation?).

Gen. Distr.: Scand., Atl. Eur., Medit. Described from Spain. Type in Geneva.

NOTE. Like the preceding species, it contains coumarin, but its odor is more pungent and stronger than in the case of our common species.

Genus 97. *HIEROCHLOE**

R. Br. Prodr. Fl. Nov. Holl. (1810) 308 (nomen conservandum). - Savastana Schrank Baier. Fl. I (1789) 100 et 337. - *Torresia* Ruiz et Pav. Fl. peruv. et chil. prodr. (1794) 125. - *Disacrum* Labill., N. Holl. pl. spec. II (1806) 82.

* From Greek *hieros* = sacred, and *chloe* = grass.



Inflorescence paniculate. Spikelets ovate, lustrous, with one perfect terminal floret and 2 staminate florets in the axils of staminate lemmas. Glumes hyaline; staminate lemmas coriaceous, ciliate on the margin, often awned; fertile lemma 5-nerved, palea 1-nerved. Stamens in perfect floret 2, in staminate florets 3. Stigmas plumose.

- 60 1. The lower staminate lemma always with a straight awn or a small point, the upper one with a rather long, geniculate awn 2.
 + Both staminate lemmas awnless or with awn consisting of a small point 3.
 2. Pedicel glabrous below the spikelet; awn of the lower staminate lemma as long as the floret; awn of the upper one longer than the floret, always geniculate 1. *H. alpina* (Liljeb.) Roem. et Schult.
 + Pedicel with a cluster of hairs below the spikelet; awn of the lower staminate lemma reduced to a small point; awn of the upper one geniculate, as long as the lemma and arising from its middle 2. *H. australis* (Schr.) Roem. et Schult.
 3. Panicle very narrow, with few spikelets; leaves narrow, involute 3. *H. pauciflora* R.Br.
 + Panicle oblong or pyramidal; leaves flat 4.
 4. Leaf sheaths glabrous or with scattered hairs 4. *H. odorata* (L.) Whlbg.
 + Leaf sheaths densely pubescent 5.
 5. Plant slender, delicate; spikelets small, ca. 2.5-3 mm long 5. *H. glabra* Trin.
 + Plant more robust; spikelets ca. 4-5 mm long 6. *H. Bungeana* Trin.

1. *H. alpina* (Liljeb.) Roem. et Schult. Syst. II (1817) 514. -Griseb. in Ldb. Fl. Ross. IV, 408; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 160. -*Aira alpina* Liljeb. Utk. Sv. Fl. ed. I (1792) 41. -Exs.: Dörfler, I. Herb. norm. No 4962.

Perennial. Plant with short creeping rhizomes, forming small tufts; culms 10-35 cm tall, smooth; leaves and their sheaths glabrous, narrowly linear, to 3 mm broad, more or less revolute; ligule short, ciliate on margin. Inflorescence oblong, more or less contracted 2-4 long, golden-brown; glumes broadly ovate, acute, naked; staminate lemmas hairy, the lower with a straight awn, the upper with a geniculate awn; perfect lemma awnless, hairy only in upper part. Spikelets occasionally proliferous (var. *vivipara* Scheutz.). June-August. (Plate IV, Figure 10).

Explanation to Plate IV

1. *Phalaris bulbosa* L., inflorescence; a) complete spikelet; b) spikelet without glumes - 2. *Ph. truncata* Guss., complete spikelets; a) spikelet without glumes - *Ph. canariensis* L., inflorescence, a) complete spikelet, b) spikelet without glumes - 4. *Ph. minor* Retz., complete spikelet, a) spikelet without glumes - 6. *Ph. paradoxa* L., inflorescence, a) individual fertile spikelet, b) group of seven spikelets, c) fertile spikelet without glumes - 8. *Digraphis arundinacea* (L.) Trin., inflorescence, a) complete spikelet, b) spikelet without glumes - 8. *Anthoxanthum odoratum* L., inflorescence; a) spikelet - 9. *A. aristatum* Boiss., inflorescence, a) spikelet - 10. *Hierochloa alpina* (Liljeb.) Roem. et Schult., spikelet - 11. *H. odorata* (L.) Whlbg., inflorescence, a) spikelet.

In moss-lichen-tundras, more rarely in stony tundras, and in the alpine zone of exposed Siberian heights. Arctic: all regions; European part: Kar. -Lap., Volg. -Kam. (northern part); West. Siberia: Ob., Alt.; East. Siberia: all regions; Far East: all regions. Gen. Distr.: Arctic, Bering., N. Am. Described from Lapland. Type in Sweden.

ECONOMIC IMPORTANCE. Contains coumarin.

2. *H. australis* (Schröd.) Roem. et Schult. Syst. veg. II (1817) 514; Griseb. in Ldb. Fl. Ross. IV, 408; Shmal'g. Fl. II, 593. -*Holcus australis* Schröd. Fl. Germ. (1806) 252. -*Id.*: Rchb. Ic. Fl. Germ. I, tab. 107, fig. 1727. -*Exs.*: Kneucker, Gram. exs. No 79.

Perennial. Forms loose tufts, with very short, creeping rhizome, or rhizomeless. Culms 20-50 cm tall, thin, smooth; leaves 3-4 mm broad, flat; sheath of terminal leaf without blade. Panicle 4-6 cm, pyramidal or one-sided; pedicels with a cluster of hairs at the base of spikelet; glumes acute, glabrous; staminate lemmas hairy on the margin, the lower with a very short awn, the upper with a geniculate awn to 3 mm long. Fertile lemma and palea glabrous, awnless. May-June.

Shady forest. -European part: Upp. Dnep., Mid. Dnep. Gen. Distr.: Scand., Centr. Eur. Described from Germany. Type in Munich.

ECONOMIC IMPORTANCE. Considered as favorite food of bison in the Belovezha Thicket, and hence the name of this grass, "Zubrovka" [zubr. aurochs]. Contains coumarin. Used in production of vodka (zubrovka), as flavoring.

3. *H. paciflora* R. Br. in Parry Voy. Suppl. No XI (Botany) (1842) 293 (193); Griseb. in Ldb. Fl. Ross. IV, 407; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 160.

Perennial. Small tufts, with creeping rhizomes; culms 10-30 cm tall, erect, smooth; leaf sheaths glabrous; leaves glabrous, narrowly linear, more or less involute; ligule ca. 1.5 mm long; inflorescence narrow, compact, 1-4 cm long and ca. 0.5 cm broad, oblong. Spikelets rounded, 3-4 mm long, more or less brownish; glumes broadly ovate, naked; staminate lemmas minutely papillose-hairy on the margin, awnless or with a small point; fertile lemma ca. 2-3 mm long, hairy toward the summit; palea with a single keel. July-August.

Growing in tundras. -Arctic: Nov. Zem., Arct. Sib., Chuk., Anad., Gen. Distr.: Arct. Amer. Described from Arctic America. Type in London.

4. *H. odorata* (L.) Whlbg. Fl. ups. (1820) 32; Shmal'g. Fl. II, 593; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 158; V. Petr. Fl. Jakut. I (1930) 128. -*Holcus odoratus* L. Sp. pl. (1753) 1048. -*Hierochloa borealis* Roem. et Schult. Syst. II (1817) 513; Griseb. in Ldb. Fl. Ross. IV, 407. -*Id.*: Rchb. Ic. Fl. Germ. I, tab. 107, fig. 1728. -*Exs.*: HFR No 195.

Perennial. Forming loose tufts, with long underground rhizomes; culms 25-70 cm tall, smooth. Leaf sheaths glabrous, smooth or scabrous (var. *firma* Nyl.), sometimes with a ring of small hairs at the base of the leaf blade (var. *annulata* V. Petr. -*H. annulata* V. Petr.); leaves flat, the radical ones elongate-pointed, those of the culm lanceolate-linear; ligule 2-4 mm long. Panicle ovoid, rather loose. Spikelets rounded-ovoid, small, ca. 3 mm long (var. *micrantha* Grun.) or larger, ca. 5 mm (var. *macrantha* Grun.), golden-brown; glumes broadly lanceolate, glabrous;

staminate lemmas minutely papillose, awnless or with a small point. Fertile lemma 5-nerved, palea 1-nerved. April-June. (Plate IV, Figure 11, a).

Water meadows, edges of forests and river banks; ascends in mountains up to 3,000 m. -European part: all regions; Caucasus: Ciscauc., West., East., and South. Transcauc.; West. Siberia: all regions; Far East: all 62 regions; Centr Asia: Aral - Pribalkh., Dzung. -Tarb., Syr-Dar., and Tyan'-Shan. Gen. Distr.: Northern temperate belt of Eur., As., and Amer. Described from Lapland. Type in London.

ECONOMIC IMPORTANCE. Awakens early in spring and flowers early. Like vernalgrass, it contains coumarin, to which it owes its odor upon drying. Of no importance as a fodder plant, as it is not eaten by livestock, but very injurious to crops, since it infests the soil with its rhizomes. Employed in production of nastolka [kind of brandy]. Used for weaving. Can be used for consolidation of slopes.

5. *H. glabra* Trin. in Spreng. Neue Entdeck. II (1821) 66; Griseb. in Ldb. Fl. Ross. IV, 407. -*H. dahurica* Trin., l.c., p. 80. -*H. jacutica* Drob. in shed. -Exs.: HFR No 2705 (var. *grandiflora* Litw.).

Perennial. Forms loose tufts, with long creeping rhizomes. Culms 10-15 (-35) cm tall, glabrous; leaf sheaths densely pubescent; leaves flat, those of the culm lanceolate, basal ones elongate-pointed; panicle oblong or pyramidal, 3-5 cm long; spikelets 2.5-3 mm long, rarely 4 mm (var. *grandiflora* Litw.), golden-brown; glumes broadly ovate, glabrous; staminate lemmas slightly hairy only at the summit and ciliate on the margin, glabrous elsewhere, without a distinct awn; fertile lemma glabrous, with few hairs only at the summit. May-July.

Mainly in solonchets meadows. -East. Siberia: Ang. -Sayan., Daur., Len. -Kol.; Far East: Ze. -Bur., Ussur. Gen. Distr.: Mongolia. Described from Dauria. Type in Leningrad.

6. *H. Bungeana* Trin. in Mém. Acad. Sc. Pétersb. sér. 6 V (1839-40) 82. -*H. odorata* var. *pubescens* Kryl. Fl. Alt. (1914) 1553. -*H. odorata* var. *Trautvetteriana* V. Petr. Fl. Jakut. I (1930) 130. -*H. Trautvetteriana* V. Petr. l.c. -Exs.: HFR No 2704 et No 949 (sub *H. odorata*). -Z. Bunge.

Perennial. Loose tufts with rather long rhizomes; culms 30-60 cm tall, smooth; leaf sheaths densely pubescent; leaves flat; radical ones rather long, those of the culm short, 2-4 mm long; panicle more or less oblong, with numerous spikelets. Spikelets rounded-ovate, 4-5 mm, more rarely to 7 mm long (f. *grandiflora* Roshev.); glumes broadly lanceolate, glabrous; staminate lemmas smooth, glabrous, densely ciliate only on the margin, awnless or with a small point; fertile lemma and palea glabrous. May-July.

River banks and meadows. -West. Siberia: Obsk.; East. Siberia: all regions; Far East: Ze. -Bur., Ud., Ussur., Sakh. Gen. Distr.: Mongolia. Described from Tyan'-Shan (China). Type in Leningrad.

ECONOMIC IMPORTANCE. Contains coumarin.

TRIBE VIII. AGROSTIDEAE KUNTH.

Kunth, in Mem. Mus. Paris, II (1815) 72.

Spikelets 1-flowered, often with a rudiment of second floret, always on more or less distinct pedicels, arranged in a contracted, spikelike, or

open panicle, or in a racemose inflorescence. Glumes 2, rarely lacking, mostly of unequal length. Lemma and palea shorter or as long as the glumes, often awned; palea shorter than the lemma, nearly always 2-nerved. Caryopsis without a longitudinal groove. Starch grains compound.

Analytical Key to Genera

1. Spikelets always with pronounced awns 2.
- + Spikelets awnless or with inconspicuous awns 18.
2. Awn trifid 98. *Aristida* L.
- + Awn simple, undivided 3.
3. Inflorescence spike-like, compact; spikelets on short, simple or divided branches 4.
- + Inflorescence paniculate, often contracted after anthesis; but not spike-like; spikelets on long, slender branches 9.
4. Glumes linear, villous-plumose, imparting a fluffy-shaggy appearance to the entire inflorescence 123. *Lagurus* L.
- + Glumes not linear, broader, glabrous or short-pubescent, not plumose 5.
5. Glumes with awn arising close to the summit 113. *Polypogon* Desf.
- + Glumes awnless, sometimes awn-pointed 6.
6. Glumes united at base, falling together with lemmas after flowering [disarticulation below the glumes] 109. *Alopecurus* L.
- + Glumes free at base, remaining on inflorescence branches after flowering 7.
7. Glumes somewhat distended, bladderlike at base, many times longer than the lemma and palea; annual plant 118. *Gastridium* P.B.
- + Glumes without bladderlike distension at base, only slightly longer than the lemma and palea; always perennials 8.
8. Lemma with a pappus of long hairs at the summit 120. *Pappagrostis* Roshev.
- + Lemma without a pappus of long hairs at the summit, but with rather long hairs at the base 119. *Calamagrostis* Adans.
9. Lemma more indurate than the glumes and tightly enveloping the caryopsis 10.
- + Lemma less indurate than the glumes and loosely enveloping the caryopsis 15.
- 64 10. Glumes shorter than the lemma and palea 105. *Muehlenbergia* Schreb.
- + Glumes, or at least one of them, shorter than the lemma and palea 11.
11. Lemma narrow, terete, with awn persisting on the fruit 12.
- + Lemma ovate or elliptical, flattened dorsally, with a slender readily deciduous awn 14.
12. Awn straight or slightly bent (but not geniculate), untwisted or almost untwisted; lemma with a short callus and with 2 short teeth at the summit 99. *Lasiagrostis* Link.
- + Awn twice or once geniculately bent, more or less distinctly twisted in lower part 13.

13. Glumes nearly always dark-tinged at base, awnless. Lemma with a short callus at base and 2 short teeth at the summit 100. *Ptilagrostis* Griseb.
 + Glumes linear-lanceolate, tapering into a long point, more rarely short-aristate; lemma with a well developed callus at base, without lobes at the summit 101. *Stipa* L.
14. Awn arising from the summit of lemma 102. *Oryzopsis* Michx.
 + Awn arising from between the two teeth in which the lemma terminates 103. *Timouria* Roshev.
15. Floret with rather long hairs at base 104. *Calamagrostis* Adans.
 + Floret naked at base 16.
16. Awn arising almost from the summit of the lemma 122. *Apera* Adans.
 + Awn arising from the back of the lemma 17.
17. Glumes prominently nerved 114. *Limnas* Trin.
 + Glumes not prominently nerved 117. *Agrostis* L.
18. Inflorescence a raceme, formed by distinct groups of spikelets aggregate in umbels; a very small plant, to 8 cm tall 111. *Coleanthus* Seid.
 + Inflorescence different 19.
19. Inflorescence a slender spike. A small plant, to 6 cm tall 110. *Mibora* Adans.
 + Inflorescence different 20.
20. Glumes shorter than the lemma and palea 21.
 65 + Glumes longer than the lemma and palea 24.
21. Annuals of the central or southern belt of the U.S.S.R. 22.
 + Perennials of the arctic or subarctic parts of the U.S.S.R. 115. *Arctagrostis* Griseb.
22. Culms 40-80 cm tall, more or less erect. Inflorescence a narrow spikelike, contracted panicle. In this country only in Western Transcaucasia, as a weed 112. *Sporobolus* R. Br.
 + Culms not exceeding 40 cm in height, semiprocumbent or ascending. Inflorescence capitate or spikelike 23.
23. Lemma and palea almost twice as long as the glumes, urceolate. Only in the Pamir-Alai region 107. *Rhizocephalus* Boiss.
 + Lemma and palea only slightly longer than the glumes, lanceolate 106. *Crypsis* Ait.
24. All spikelets more or less pubescent 107. *Alopecurus* L.
 + Spikelets glabrous or glabrescent 25.
25. Lemma with rather long hairs at base 26.
 + Lemma without hairs at base 27.
26. Lemma always with a more or less pronounced awn 119. *Calamagrostis* Adans.
 + Lemma awnless or merely mucronate; only in seaboard sands 121. *Ammophila* Host.
27. Lemma and palea perceptibly more indurate than the glumes 104. *Milium* L.
 + Lemma and palea not more indurate than the glumes 28.
28. Inflorescence spikelike 108. *Phleum* L.
 + Inflorescence paniculate 29.

29. Lemma as long as the glumes, with a short, inconspicuous, straight awn at the summit; spikelets always light green; palea 1-keeled; stamens solitary 116. *Cinna* L.
+ Lemma always shorter than the glumes 117. *Agrostis* L.

Subtribe 1. *Stipeae* Nees *Agrost. Brasil.* (1829) 371. -Lemma and palea become indurate at maturity (at any rate more so than glumes) and tightly envelop the caryopsis.

Genus 98. *ARISTIDA** L.

L. Sp. pl. ed. 1. (1753) 82.

Inflorescence terminal, more or less open. Spikelets 1-flowered, perfect. Glumes narrow, keeled, pointed, awnless. Lemma and palea shorter than the glumes, coriaceous. Lemma tightly enveloping the caryopsis, with a trifid awn at the summit and a pointed callus at base. Palea 2-nerved, 66 somewhat shorter than the lemma, sometimes lacking. Lodicules 2. Stamens 3. Stigmas plumose. Caryopsis narrow, free.

1. All three divisions of the awn naked 1. *A. adscensionis* L.
- + At least one of the divisions of the awn plumose 2.
2. All three divisions of the awn plumose 3.
- + Central division of the awn plumose, lateral divisions naked or almost so 4.
3. Plant 30-40 cm tall, divisions of the awn ca. 1-1.5 cm long
. 2. *A. pennata* Trin.
- + Plant 80-150 cm tall. Divisions of the awn ca. 2 cm long
. 3. *A. Karelini* (Trin. et Rupr.) Roshev.
4. The entire awn ca. 5-6 cm long 4. *A. plumosa* L.
- + The entire awn ca. 12 cm long 5. *A. arachnoidea* Litw.

Section 1. *Chaetaria* (P. B.) Trin. et Rupr. in *Mém. Acad. Sc. Pétersb.*, sér. 6, VII, 2 (1842) 100. -Awn persistent, with naked divisions.

1. *A. adscensionis* L. Sp. pl. (1753) 82; Henrard, *Crit. rev. gen. Aristida* (1926-28) 8. -*A. coerulescens* Desf. *Fl. atl.* I (1798) 109, tab. 21, fig. 2. -*A. vulgaris* Trin. et Rupr. in *Mém. Acad. Sc. Pétersb.*, sér. 6, VII, 2 (1842) 131. -*A. Heymanni* Rgl. in *A. H. P.* VII (1880) 649. -*Id.*: Desf. l.c.; *Fl. Az. Ross.* [*Fl. As. Russ.*] XII (1916) 111, tab. VII, 1.

Annual in this country (in other countries often perennial). A plant with thin, fibrous roots; culms 10-60 cm tall, tufted; leaves narrowly linear, acuminate, more or less involute, more rarely flat, sharply scabrous on the nerves above, glabrous below; ligule short, ciliate. Inflorescence 5-20 cm long, narrow, loose, often interrupted, with short lateral branches; spikelets narrow, linear-lanceolate, whitish-green or more or less purplish; glumes narrow, subulate, scabrous on the keel; the lower glume ca. 5 mm long, the upper glume ca. 7 mm long; lemma narrow, sublinear, ca. 8 mm long, glabrous or somewhat scaberulous, with a callus at the base and terminating in an awn trifid from the base; the central division of the awn ca.

* Name applied by Flisy to a xerophytic, aristate grass.

15 mm long, somewhat longer than the lateral divisions, all rather sharply scabrous on the margin. May–September. (Plate V, Figure 1).

In dry sandy and stony places; not ascending into the mountains. Caucasus: South. Transcauc.; Centr. Asia: Aral.–Casp., Pribalkh., Dzung.–Tarb., Syr–Dar., Tyan'–Shan. Gen. Distr.: West. Medit., Ind.–Him., Dzung.–Kashg., Mong., also a tropical cosmopolitan. Described from Ascension Island. Type in London.

Section 2. *Stipagrostis* (Nees) Trin. et Rupr. in Mém. Sc. Pétersb., sér. 6, VII, 2 (1842) 163. –Awn deciduous, with plumose divisions.

- 67 2. *A. pennata* Trin. in Acta Petrop. (1815) 488, tab. 10; Shmal'g. Flo. II, 594; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 161. –*A. pungens* Griseb. (non Desf.) in Ldb. Fl. Ross. IV, 451. –*A. pungens* var. *pennata* Trautv. in A. H. P. I (1871) 17. –*Id.*: Fl. Az. Ross. (Fl. As. Russ.) XII (1916), tab. VII, 8. –*Exs.*; HFR No 899.

Perennial. Tufted; roots penetrating deep into the soil, with long underground rhizomes, to 10 m and longer, which give rise to new plants at the nodes; culms 30–40 cm tall, branching at base, glabrous; leaves narrow, more or less setaceous–involute, more rarely almost flat, somewhat soft or very hard, subulate–involute (var. *rigida* Roshev.) more or less smooth. Ligule short, ciliate. Inflorescence open, enveloped in lower part by the sheath of the terminal leaf; spikelets narrow, 1.25–1.5 cm long, whitish; lemma naked, half as long as the glumes, with a trifid awn; divisions of the awn more or less alike, ca. 1.5 cm long, plumose–pubescent all the way up, or shorter, ca. 1.5 cm long, with shorter hairs or almost hairless toward the summit (var. *minor* Litw.). April–July. (Plate V, Figure 6–8).

In loose sands of the type approaching sand dunes, as well as on sand dunes, more rarely on shifting dunes. –European part: Low. Volg.; Caucasus: Ciscauc., West. Transcauc.; West. Siberia: Irt. (south. part); Centr. Asia: all regions in sands. Gen. Distr. Iran, Dzung.–Kashg. Described from the desert between Volga and Ural. Type in Leningrad.

ECONOMIC IMPORTANCE. Before heading, readily eaten by livestock, especially by horses. It appears in some places in sufficient quantity for cutting. Undoubtedly plays an important role in the economic utilization of sandy deserts. One of the most important plants for consolidation of loose sands.

3. *A. Karelini* (Trin. et Rupr.) Roshev. sp. nov. in Adenda p. 740 –*Aristida pennata* var. *Karelini* Trin. et Rupr. in Mem. Acad. Sc. Petersb., ser. 6, VII 2 (1842) 177. –*Id.*: Fl. Az. Ross. (Fl. As. Russ.) XII (1916) tab. VII, 9. –*Exs.*: HFR No 900.

Perennial. Large plants, 80–150 cm tall; roots penetrating deep into the soil, with underground rhizomes; culms branching at base, glabrous. –Inflorescence open, enveloped in lower part by the sheath of the terminal leaf; spikelets narrow, ca. 2 cm long, whitish. Glumes glabrous, the lower somewhat longer than the upper; lemma half as long as the glumes, with a deciduous trifid awn; awn naked at base, with plumose divisions, ca. 2 cm long, subequal; plumosity very short or almost lacking toward the end of divisions. July–August. (Plate V, Figure 9).

Shifting dune–sands. –Central Asia: Aral.–Casp. (Mangyshlak), Pribalkh. (very rarely), Kyz.–Kum., Amu–Dar. Endemic. Described from Turkmenia. Type in Leningrad.

68 ECONOMIC IMPORTANCE. Eaten somewhat less readily than the preceding species. Can be made into hay. Of immense economic importance, since, apart from its feed value, it is one of the pioneering plants on dunesands, which it consolidates to a considerable extent and transforms into fixed dunes. Flowers somewhat later than *A. pennata* Trin.

4. *A. plumosa* L. Sp. pl. ed. 2 (1763) 1666; Griseb. in Ldb. Fl. Ross. IV, 451. -Ic.: Fl. Az. Ross. (Fl. As. Russ.) XII (1916) tab. VII, 2-4. Exs.: Herb. Fl. Cauc. No 256 (var. *Szovitsiana* Trin. et Rupr.); HFR No 1195 (var. *Eichwaldiana* Trin. et Rupr.) et No 1196 (var. *intermedia* Litw.).

Perennial. Tufted. Culms 10-30 cm tall, branching at base, rather densely tomentose in lower part; leaves setaceous-involute, glabrous; ligule short, ciliate. Inflorescence narrow, enveloped in lower part by the sheath of the terminal leaf; spikelets erect; glumes glabrous, the upper somewhat shorter than the lower; lemma narrowly lanceolate, half as long as the glumes, terminating in a trifid awn; awn geniculate: undivided and naked below the bend, parting into 3 divisions above it; central division plumose right down or nearly down to its base or (var. *Szovitsiana* Trin. et Rupr.) or naked below up to 1/5 of its length (var. *intermedia* Litw.), or up to 1/3 of its length (var. *Eichwaldiana* Trin. et Rupr.); lateral divisions half as long as the central one, naked or sharply scabrous. May-August. (Plate V, Figure 2-4).

On sands. -Caucasus: East. and South. Transcauc., Tal., Centr. Asia: Kyz. -Kum., Kara-Kum., Upp. Turkm., Amu-Dar., Syr-Dar., Pam.-Al. (Shirabad, Kulyab). Gen. Distr.: East. Medit., Balk. -As. Min., Arm. -Kurd., Iran. Described from Armenia. Type in London.

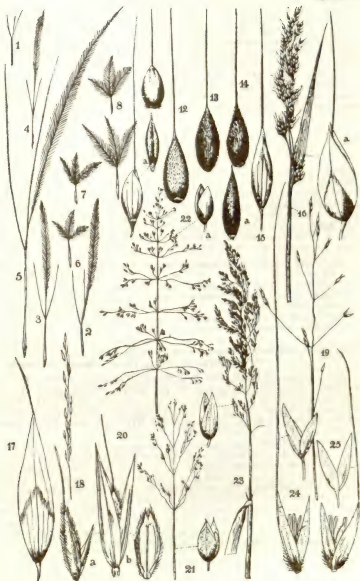
ECONOMIC IMPORTANCE. A sand-fixing plant. Eaten unwillingly by livestock before flowering, but readily when fruits are ripe.

5. *A. arachnoidea* Litw. in Trav. Mus. Bot. Acad. Sc. Pétersb. I (1902) 21. -Ic.: Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 21, tab. VII, 5. -Exs.: HFR NO 2449.

Perennial. Plant branching at base; culms 20-40 cm tall, more or less ascending; culms and leaf sheaths covered with woolly-cobwebby pubescence. Leaves narrow, cuneate-involute, coated with cobwebby-woolly hairs in

Explanation to Plate V.

1. *Aristida adscensionis* L. lemma with awn. -2. *A. plumosa* L. var. *Szovitsiana* Trin. et Rupr. lemma with awn. -3. *A. plumosa* L. var. *intermedia* Litw. lemma with awn. -4. *A. plumosa* var. *Eichwaldiana* Trin. et Rupr. lemma with awn. -5. *A. arachnoidea* Litw. lemma with awn. -6. *A. pennata* Trin. var. *minor* Litw. lemma with awn. -7. *A. pennata* Trin. var. *rigida* Roshev. lemma with awn. -8. *A. pennata* Trin. var. *typica* lemma with awn. -9. *A. Karelinae* (Trin. et Rupr.) Roshev. lemma with awn. -10. *Oxytropis virescens* (Trin.) Hack. Spikelet and lemma. -11. *O. coerulescens* (Desf.) Hack. lemma with awn. -12. *O. holciformis* (M.B.) Hack. lemma with awn. -13. *O. songorica* (Trin. et Rupr.) B. Fedtsh. lemma with awn. -14. *O. kokanica* (Rgl.) Roshev. lemma with awn. -15. *O. ferganensis* Litw. spikelet; a) lemma. -16. *O. latifolia* Roshev. inflorescence; a) spikelet. -17. *O. kopetdagensis* Roshev. spikelet. -18. *O. molinioides* (Boiss.) Hack. inflorescence. -19. *O. purpurascens* Hack. inflorescence. -20. *Timouria Saposhaikowi* Roshev. a) b) spikelet, and lemma and palea. -21. *Millium vernale* M.B. inflorescence and spikelet. -22. *M. effusum* L. a) spikelet. -23. *M. Schmidtianum* C. Koch. inflorescence and spikelet. -24. *Muehlenbergia Hugelii* Trin. glumes and floret. -25. *M. japonica* Steud. glumes and floret.



lower part, glabrescent toward the apex; ligule short, ciliate. Inflorescence narrow, with few spikelets; spikelets narrow, long-pedicelled, erect; glumes cobwebby-hairy in lower part, the lower glume 4-6 cm long, the upper glume 3-3.5 cm long, both narrowly lanceolate; lemma 11-12 mm long, with a trifid awn; awn geniculate, undivided, naked up to the bend, then parted into three divisions; the central division 7-8 cm long, broadly plumose; lateral divisions 5-6 cm long, with shorter plumose hairs only in middle part. May-July. (Plate V, Figure 5).

Growing only in gypseous sands. -Centr. Asia: Kara-Kum., Upp. Turkm., Amu-Dar., Pam.-Al. (south-west). Endemic. Described from Turkmenistan, from sands near Uch-Adzhi. Type in Leningrad.

Genus 99. LASIAGROSTIS* LINK.

Link, Hort. berol. I (1827) 99.

Inflorescence a more or less open, more rarely narrow, contracted panicle. Spikelets more or less compressed laterally, 1-flowered, perfect. Glumes more or less hyaline, lanceolate or oblong, sometimes tapering to a short point which is much shorter than itself, awnless. Lemma coriaceous, harder than the glumes, tightly enveloping the palea, with a short callus at base and terminating in 2 short teeth and a straight, slightly bent, untwisted awn, to 20 cm long; lodicules 3, stamens 3; pistil short with plumose stigmas. Caryopsis free, with a linear groove.

1. Spikelets 8-10 mm long; palea shorter by 1/4 than the lemma; in Crimea and Caucasus 1. *L. bromoides* Nevski et Roshev.
- + Spikelets 5-7 mm long; palea only slightly shorter than the lemma 2.
2. Upper glume longer by 1/4 to 1/5 than the lower; lemma and palea as long as the glumes 3. *L. splendens* (Trin.) Kunth.
- + Glumes of equal or almost equal length 3.
3. Panicle open; lemma 3-4 mm long 2. *L. caragana* Trin. et Rupr.
- + Panicle contracted, linear; lemma 5-5.5 mm long 4. *L. longearistata* (Boiss.) Roshev. et Nevski.

- 72 1. *L. bromoides* (L.) Nevski et Roshev. comb. nov. -*Stipa aristella* L. Syst. Nat. ed. 12 III (1768) 229; Shmal'g. Fl. II, 596. -*Agrostis bromoides* L. Mant. I (1767) 30. -*Aristella bromoides* Bert. Fl. ital. I (1833) 690; Griseb. in Ldb. Fl. Ross. IV, 447. -*Stipa bromoides* Brand in Koch, Syn. ed. 3 III (1907) 2718. -*Stipa* Rchb. Ic. Fl. Germ. I, tab. 46, fig. 1461. -*Exs.*: Fl. cauc. exs. No 256.

Perennial. Tufted; short creeping rhizomes; culms 40-80 cm tall, slender, smooth; leaves narrowly-linear, setaceous-involute, glabrous, very scabrous on the midrib and on lateral veins; ligule very short, or obsolete. Inflorescence a panicle, to 25 cm long, narrow, linear, contracted, with few spikelets, nodding at the top; spikelets 8-10 mm long and ca. 1 mm broad, whitish-green; glumes hyaline, slightly unequal, 3-nerved, narrowly lanceolate; lemma 6-8 mm long, covered with appressed hairs, more densely hairy at the base, with 2 teeth at the summit and an awned from between the teeth. Awn 2-2.5 times as long as the lemma, straight, not twisted, scaberulous. May-August. (Plate VI, Figures 7-9).

* From Greek *lasios* - densely pubescent, and *agrostis* - bentgrass.

In dry, stony places. -European part: Crimea; Ciscauc., Dag. (rarely), West. and East. Transcauc. Gen. Distr.: Northern part of Medit., Balk. -As. Min. Described from Southern France (Montpelier). Type in London.

2. *L. caragana* Trin. et Rupr. in Mém. Acad. Pétersb. sér. 6, VII, 2 (1842) 90; Griseb. in Ldb. Fl. Ross. IV, 446. -*Stipa Caragana* Trin. in Mem. Acad. Petersb., ser. 6, I (1829) 74. -*Oryzopsis pallescens* Westb. in Act. Horti Bot. Univ. Jurjev. V (1905) 147. -*O. virescens* var. *pallescens* Fomins et Woron. in Oprel. rast. Kavk. i kryma (Ident. pl. Cauc. and Crimea) I (1908) 75. -Exs.: Kneuck. Gram. exs. No 5 (sub *Stipa Redowskii* Trin.).

Perennial. Tufted; culms erect or somewhat ascending, 30-100 cm tall, with 3-5 internodes, glabrous; leaf sheaths shorter than the internodes, glabrous; leaves narrowly linear, subulate-involute, more rarely flat; ligule very short. Inflorescence loose, with branches 10.5 cm long; spikelets lanceolate, ca. 5 mm long, whitish; glumes subequal, lanceolate, 3-nerved; lemma shorter than the glumes, 3-4 mm long, pubescent, with 2 teeth at the summit and an awn arising from between the teeth; awn 2-3 times longer than the lemma, straight or bent, slightly twisted, very brittle. May-July. (Plate VI, Figure 10-12).

Mountain slopes, mounds, and mountain valleys. -Caucasus: Ciscauc., Dag., East., and South. Transcauc.; West. Siberia: Irt.; Centr. Asia: all regions. Gen. Distr.: Iran, Dzung. -Kashg. Described from the Eastern coast of the Caspian Sea. Type in Leningrad.

ECONOMIC IMPORTANCE. This *Lasiagrostis* is of secondary importance as a fodder plant; eaten less readily by livestock than the preceding species.

3. *L. splendens* (Trin.) Kunth, Rev. Gram. I (1829) 58; Griseb. in Ldb. Fl. Ross. IV, 446. -*Stipa splendens* Trin. in Spreng. Neue Ent. 73 II (1821) 54. -*St. altaica* Trin. in Ldb. Fl. Alt. I (1829) 80. -*Aristella longiflora* Rgl. in A.H.P. VII (1880) 645 (specimen infested by fungi!).

Perennial. Forming large, compact, tussocklike tufts; culms 50-250 cm tall, numerous, erect, stout, smooth, with numerous remains of old leaf sheaths; leaves long, narrow, usually revolute, very rigid; ligule elongated, more or less pointed. Panicle narrow, more or less contracted, 15-50 cm long, with subverticillate branches; spikelets 5-6 mm long, more or less purple-tinged, more rarely whitish (f. *pallescens* Roshev.). Glumes lance-elliptical, acute; the lower glume 5-6 mm long, the upper glume 1/4-1/5 shorter than the lower; lemma 5-6 mm long, densely pubescent all over the surface, with 2 teeth at the summit and an awn arising from between the teeth, and with a short callus at the base; awn twice as long as the lemma, straight or bent, very faintly twisted. May-July. (Plate VI, Figure 13-21).

In steppes, often in sandy, stony, or saline soils; always associated with a high water table; rising in the mountains up to 3,600 m. -European part: Volg. -Kam., Zavolz., Low. Volg.; West. Siberia: Upp. Tob., Irt., Alt. East. Siberia: Ang. -Sayan., Daur.; Centr. Asia: all regions. Gen. Distr. Iran, Dzung. -Kashg., Mong. Described from Zabaikal'e [Transbaikalia]. Type in Leningrad.

ECONOMIC IMPORTANCE. Not eaten willingly by livestock, on account of the very rigid stems and leaves. Eaten more readily by cattle in winter and spring in pasture or in the form of hay cut in young state. However, in spite of its poor quality as fodder, it is of immense importance, as it

does not suffer from drought and thus provides the sole feed in years unfavorable for other plants, while in winters with a high snow cover on pastures it is one of the few plants which, owing to tall growth, are not damaged by the snow. It is also of outstanding economic importance for the inhabitants of dry steppes, as its stout, smooth, long culms are made into mattings, floor-mats, fences, and walls for summer tents of nomads; it is also often used as fuel. Quite suitable for paper manufacture.

4. *L. longearistata* (Boiss.) Roshev. et Nevski comb. nova. - *Piptatherum longearistatum* Boiss. et Hausskn. in Boiss. Fl. Or. V (1884) 509. - *Oryzopsis longearistata* Roshev. in Fl. Turkmenist. I (1932) 82. - *Piptatherum turcomanicum* Litw. (nomen) in "Pl. turcom. ann. 1897 et 1898 lectae et editae" No 184 (lithogr.). - *Oryzopsis turcomanica* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) VII (1916) 184. - *Lasiagrostis Nevskii* Roshev. in herb. Inst. Bot. Acad. Sc. URSS. - *Stipa Litwinowiana* P. Smirn. in herb. Inst. Bot. Acad. Sc. URSS.

Perennial. Tufted; rhizomes short, creeping. Culms 80-150 cm tall, ascending, with 4-5 internodes, glabrous, with scaly leaves (without blades) 74 at base; leaves narrowly lanceolate, to 7 mm broad, more or less folded, minutely pubescent on the upper surface; ligule ca. 0.5 mm long, obtuse. Panicle narrow, contracted, 15-25 cm long. Spikelets narrowly lanceolate, 6-7 mm long, whitish. Glumes lanceolate, 6-7 mm long, subequal, hyaline. Lemma narrowly lanceolate, 5-5.5 mm long, brown close to the fruit, covered with readily falling hairs, awned from the summit. Awn 2-2.5 times as long as the lemma, slender, straight, scabrous, readily falling. May-August. (Plate VI, Figures 1-6).

Stony mountain slopes. - Centr. Asia: Upp. Turkm., Amu-Dar. Tyan'-Shan. Gen. Distr.: Iran (Northern part). Described from Kurdistan. Type in Geneva.

Genus 100. PTILAGROSTIS GRISEB.

Griseb. in Ldb. Fl. Ross. IV (1853) 447.

Inflorescence a rather open panicle. Spikelets perfect, 1-flowered. Glumes alike, hyaline, nearly always dark-tinged at base, more or less lanceolate, awnless. Lemma and palea slightly harder than the glumes; lemma with short a callus at base, terminating in two short teeth and awned from the summit. Awn always twice geniculate, plumose. Ovary naked, with plumose stigmas.

1. Awn plumose below, naked above 1. *P. subsessiliflora* (Rupr.) Roshev.
- + Awn plumose all the way up 2.
2. Glumes narrow, long, 1-1.5 cm, pointed. Awn 5-8 cm long 4. *P. purpurea* (Griseb.) Roshev.
- + Glumes 0.5-0.7 mm long; awn not exceeding 3 cm in length 3.
3. Awn of the spikelet 0.6-1.0 cm long 2. *P. concinna* (Hook.) Roshev.
- + Awn of the spikelet 2-3 cm long 3. *P. mongholica* (Turcz.) Griseb.

1. *P. subsessiliflora* (Rupr.) Roshev. comb. nov. - *Stipa subsessiliflora* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 129. - *Lasiagrostis* (Leptanthele) *subsessiliflora* Rupr. in Osten-Sacken et Rupr. Sert. Tiansch. (1869) 35. - *Ptilagrostis sidiyachestvetkovyi* [with sessile flowers].

Perennial. Forming small compact tufts; culms 10-35 cm tall, erect, smooth, glabrous; sheaths smooth; those of cauline leaves long, those of radical leaves short, forming dense brushes from dead leaves; leaves narrowly linear, thin, setaceous-involute, scabrous; radical leaves to 10 cm long, culm leaves shorter; ligule oblong-pointed, naked. Inflorescence narrow, 4-12 cm long; spikelets ca. 7 mm long, lanceolate, subequal; lemma 5-6 mm long, brown, hairy, with a short callus, naked below; awn 75 20-25 cm long, twice geniculate, shortened below, straight and naked above. July-August. (Plate VI, Figure 33-37).

In meadows of the alpine area. - Centr. Asia: Tyan'-Shan. Endemic. Described from Tyan'-Shan, Toyanda, and Suukta Valley, 30 July, 1869. (Osten-Sacken). Type in Leningrad.

2. *P. concinna* (Hook) Roshev. comb. nov. - *Stipa concinna* Hook. Fl. of Br. Ind. (1897) 230.

Perennial. Forming small tufts; culms 15-25 cm tall, smooth, with numerous remains of old leaf sheaths at the base; leaves 5-10 cm long, narrow, thin, setaceous-involute; ligule oblong. Inflorescence loose, narrow, 3-5 cm long, with short branches and erect spikelets; the latter 5-7 mm long, more or less purple-tinged at the base; glumes subequal, membranaceous, the lower 1-nerved, the upper 3-nerved; lemma 3-5 mm long, brownish, glabrescent, with a very short, pubescent callus; awn 6-10 mm long, twice geniculate, plumose throughout its length, longer-plumose in the lower, twisted part than in the upper; straight part. July.

Subalpine and alpine meadows and slopes. - Centr. Asia: Tyan'-Shan. Gen. Distr.: Tibet. Described from Tibet. Type in London.

3. *P. mongholica* (Turcz.) Griseb. in Ldb. Fl. Ross. IV (1653) 447. - *Stipa mongholica* Turcz. ex Trin. in Bull. Sc. Acad. Pétersb. I (1836) 67. - *S. filiformis* Turcz. in sched. olim. - *Lasiagrostis mongholica* Trin. et Rupr. in Mém. Acad. Pétersb. ser. 6, VII, 2 (1842) 87. - *L. (Leptanthele) alpina* Fr. Schmidt, Reise im Amurlande (1868) 73. - *Stipa Czekanowskii* V. Petr. Fl. Jakut. I (1930) 136. - *Stipa alpina* (Fr. Schmidt) V. Petr. 1. c.

Perennial. Densely tufted; culms 15-60 cm tall, glabrous, sometimes purple-tinged; leaf sheaths shorter than the internodes, glabrous, scaberulous; leaves narrow, setaceous-involute, very scabrous; ligule ca. 2 mm long, obtuse. Inflorescence 5-15 cm long, paniculate, loose, with few spikelets; spikelets oblong-lanceolate, ca. 6 mm long, more rarely 4.5-5 mm (var. *minutiflora* Titov in herb.), more or less dark-tinged at the base, white on the margin; lemma nearly as long as the glumes, dark-tinged, glabrescent above, unevenly pilose below, with a short callus; awn 2-3 cm long, more rarely 1.5-2 cm (var. *minutiflora* Titov), plumose, hairy throughout, twice geniculate, twisted below; stamens with naked, more rarely terminally pubescent, anthers (var. *barbellata* Roshev.). June-July. (Plate VI, Figures 43-47).

In alpine and subalpine meadows, descending slightly below the forest line. - West. Siberia: Alt.; East. Siberia: all regions; Far East. Ze. - Bur.;

Centr. Asia: Dzung.-Tarb., Tyan'-Shan. Gen. Distr.: Dzung.-Kashg., Mong. Described from Northern Mongolia. Type in Leningrad.

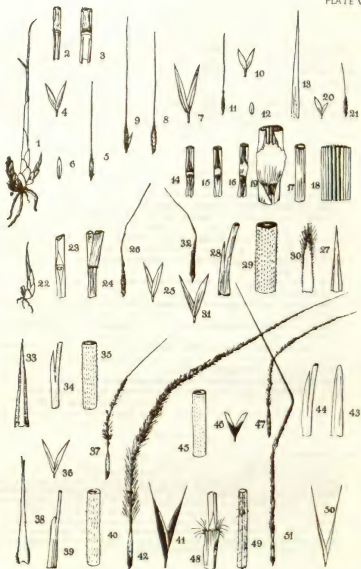
- 76 4. *P. purpurea* (Griseb.) Roshev. comb. nov. - *Stipa purpurea* Griseb. in Goett. Nachr. (1868) 82. - *Lasiagrostis* (Leptanthele) tremula Rupr. in Osten-Sacken et Rupr. Sert. Tiansch. (1869) 35. - *Stipa Semenowi* Krassn. in Scrip. Hort. Univ. Petrop. II, 1 (1887-88) 22. - *S. Semenovi* Krassn. in Zap. Russk. Geogr. Obshch. (1888) 341. - *Ptilagrostis Semenovi* Krassn. 1. c., 348. - *P. tianshanica* Krassn. in herb. -

Perennial. Small tufts; culms 15-35 cm tall, erect, glabrous, smooth; leaves narrowly linear, setaceous-involute, smooth, more rarely scabrous, the radical leaves longer than the sheaths, the culm leaves shorter; ligule 1-2 mm long. Inflorescence 5-15 cm long, with few spikelets, open, with slender branches; spikelets narrowly-lanceolate, dark purple; glumes hyaline, 13-17 mm long, narrowly-lanceolate, equal; lemma 8-10 mm long, hairy almost to the summit, with a callus 2-2.5 mm long; awn 5-8 cm long, twice geniculate, twisted below, plumose throughout its length. June-August. (Plate VI, Figures 38-42).

High-mountain steppes and stony slopes. - Centr. Asia: Pam.-Al., Tyan'-Shan. Gen. Distr.: Tibet. Described from the Himalayas. Type in London.

Explanation to Plate VI.

1-6. *Lasiagrostis longearistata* (Boiss.) Roshev. et Nevskii: 1 (1/1) extravaginal shoot; -2. (2/1) ligule of a leaf from a sterile shoot; -3. (2/1) ligule of a leaf from a culm; -4. (2/1) glumes; -5. (2/1) lemma with awn; -6. (2/1) fruit; -7-9. *L. blomoides* (L.) Nevskii et Roshev. (2/1); -7. glumes; -8. lemma with awn; -9. same, with palea deflected; -10-12. *L. caragana* Trin. et Rupr. (2/1); 10. glumes; 11. lemma; 12. fruit; -13-21. *L. splendens* (Erin.) Kunth: 13. (1/1) leaf tip; -14-16. (2/1) ligule of lower, middle, and upper leaves of a sterile shoot; -17. (2/1) rolled-up leaf blade from a sterile shoot, from the outside; 18. (2/1) unrolled, from the inside; 19 (2/1) ligule of an upper culm leaf; -20-21 (2/1) glumes and lemma; -22-26. *S. sibirica* (L.) Lam.: 22. (1/1)-extravaginal shoot; 23. (2/1) ligule of a leaf from a sterile shoot; 24. (2/1) base of a leaf blade from a sterile shoot, pubescent on the outside; 25-26. (2/1) glumes and lemma; -27-32. *S. Regeliana* Hack. 17. (3/2) leaf tip; 28. (2/1) ligule of a leaf from a sterile shoot; 29. (5/1) middle part of a leaf blade from a sterile shoot; 30. (5/1) tassel at the end of a young leaf from sterile shoot; 31-32. (2/1) glumes and lemma; -33-37. *Ptilagrostis subsessiliflora* (Rupr.) Roshev.: 33. (3/2) leaf tip; 34. (2/1)-ligule of a leaf from a sterile shoot; 35 (5/1) middle part of a leaf blade from a sterile shoot; 36-37. (2/1) glumes and lemma; -38-42. *P. purpurea* (Griseb.) Roshev.; -38. (3/2) leaf tip; 39. (2/1) ligule of a leaf from a sterile shoot; 40. (5/1) middle part of a leaf blade from a sterile shoot; 41-42. (2/1) glumes and lemma; -43-47. *P. mongolica* (Turcz.) Griseb.: 43. (3/2) leaf tip; 44. (2/1) ligule of a leaf from a sterile shoot; 45. (5/1) middle part of a leaf blade from a sterile shoot; 46-47. (2/1) glumes and lemma; -48-51. *S. tortilis* Desf.: 48 (2/1) ligule of a lower leaf; 49. (5/1) middle part of a blade of a lower leaf; 50-51. (2/1) glumes and lemma.



L. Sp. pl. (1753) 78.

Spikelets 1-flowered, arranged in a contracted, more rarely open, panicle. Glumes oblong-lanceolate, acute, or, more rarely linear-lanceolate, tapering into a long aristate point. Lemma coriaceous, harder than the glumes, tightly enveloping the palea, entire at the summit, always waned, and furnished with an obliquely pointed callus, which is rather long and pubescent at the base. Awn usually long, often geniculate, naked or plumose. Lodicules 3. Stamens 3. Pistil short, with plumose stigmas. Caryopsis free, with a linear groove. Perennials, rarely annuals, forming usually dense tufts. Leaves usually setaceous-folded, more rarely flat.**

1. Glumes lanceolate or oblong, sometimes tapering to a short point (much shorter than the glume) 2.
- + Glumes linear-lanceolate, tapering to a long, aristate point 4.
2. Awn densely pubescent below, glabrescent above. Only in Dzungarian Alatau and Tien Shan 1. *S. Regeliana* Hack.
- + Awn entirely naked or minutely pubescent below 3.
3. Panicle broadly diffuse; leaves flat, 7-12 mm broad 3. *S. effusa* (Maxim.) Nakai.
- + Panicle more or less contracted, not diffuse; leaves narrow, long, usually involute 2. *S. sibirica* (L.) Lam.
4. (1). Terminal segment of the awn plumose-hairy, hairs of the plume 2-7 mm long 5.
- + Terminal segment of the awn with short hairs, to 0.6 mm, rarely to 1 mm long 41.
5. The twisted lower segment of the awn 1/8 (to 1/10) as long as the upper segment 6.
- + The twisted lower segment of awn 1/3-1/2 as long as the upper segment 12.
- ++ The twisted lower segment of the awn ca. 1/5 as long as the upper segment 9. *S. longiplumosa* Roshev.
- 80 6. Awn with hairs throughout its length 7.
- + Awn naked or scaberrulous below, plumose above 10.
7. Awn 13-14 cm long, with hairs 4-5 mm long 4. *S. aktauensis* Roshev.
- + Awn 18-20 cm long, with hairs 7-10 mm long 8.

* From Greek *stupsion* = tow.

** The presentation of needlegrasses for the "Flora of the U. S. S. R." had originally been entrusted to the specialist of the genus *Stipa*, P. A. Smirnov. However, since he had not submitted his manuscript in time and the publishers could not further delay the printing of the "Flora", I was urgently requested to prepare the manuscript. Taking into consideration the very extensive investigations conducted by Smirnov in recent years on the specific composition of this difficult genus, I have accepted in the present work, with few exceptions, the lines of approach established by Smirnov, as they are presented in his published studies, in a manuscript key to species of the genus *Stipa* for the "Flora of the U. S. S. R.", and in the herbarium material of BIN (Botanicheskiy Institut - Botanical Institute). Unfortunately, some of the unpublished species, mentioned by him, were not available to me, and have therefore not been included. R. Rozhevits.

8. Awn 23-27 cm long, with hairs ca. 7 mm long 6. *S. magnifica* Junge.
 + Awn to 20 cm long, with hairs ca. 8 mm long. 9.
9. Lemma 12-13 mm long; awn with plumosity of equal density throughout its length 7. *S. Ovczinnikovii* Roshev.
 + Lemma 14-16 mm long; awn with much sparser hairs on the lower, twisted segment than above 5. *S. lingua* Junge.
10. Awn long, 17-21 cm, with hairs ca. 7 mm long 8. *S. Lipskyi* Roshev.
 + Awn 7-11 cm long 11.
11. Lemma with one band of long hairs on the back and a naked callus, ... 10. *S. karataviensis* Roshev.
 + Lemma with several bands of hairs on the back and a pubescent fringe at the base, beside the callus, ... 11. *S. tianschanica* Roshev.
12. (5). Awn once-geniculate 13.
 + Awn twice-geniculate 14.
13. Leaves glabrous, smooth, rarely somewhat scabrous on the outside, ... 12. *S. caucasica* Schmalh.
 + Leaves covered on the outside with small, semiappressed, setiform hairs 13. *S. glareosa* P. Smirn.
14. Awn distinctly hairy on the twisted lower segment 15.
 + Awn naked, smooth or scabrous on the twisted lower segment ... 22.
15. Awn broadly plumose, with hairs 3-7 mm long 16.
 + Awn narrowly plumose, with hairs to 2 mm long 19.
16. Awn 4.5-6 cm long, with hairs 3-4 mm long 14. *S. orientalis* Trin.
 + Awn 20-40 cm long, with hairs 4-7 mm long 17.
17. Sheaths of lower leaves minutely pubescent. Leaves setaceous-involute, pubescent within, sharply scabrous or rather densely appressed-hairy on the outside, Western Siberia, ... 39. *S. Iljini* Roshev.
 + Sheaths and blades glabrous or scaberulous 18.
18. Sheaths of young leaves ciliate on the margin. Lemma 17-22 (-25) mm long, with a marginal band of hairs extending as far as the awn; Crimea, Caucasus 34. *S. paradoxa* (Junge) P. Smirn.
 + The youngest leaves with an apical tassel of hairs, up to 3 mm, later falling readily. Lemma 17-18 mm long, with a band of marginal hairs not extending as far as the awn 28. *S. anomala* P. Smirn.
19. Lemma 5-7 mm long 20.
 + Lemma 9-12 mm long 21.
20. Awn slightly twisted below, with hairs of equal length throughout, not exceeding 1 mm 15. *S. Richteriana* Kar. et Kir.
 + Awn strongly twisted below, with shorter hairs than in upper part where they attain 1.5 mm in length. In eastern Tien Shan, ... 16. *S. breviflora* Griseb.
21. Leaf sheaths shorter than the internodes; leaves pubescent on the inside, scabrous or pubescent on the outside; ligule to 5 mm long. Glumes 2.5-3.5 cm long 17. *S. Szowitsiana* Trin.
 + Leaf sheaths longer than the internodes; leaves glabrous, smooth; ligule to 1 mm long, blunt; glumes 3.5-4.5 mm long; only in southern Transcaucasia 18. *S. armeniaca* P. Smirn.

22. (14). Awn short, 4-5(-7) cm long 19. *S. gracilis* Roshev.
 + Awn longer, not less than 8 cm long 29.
23. Hairs on the awn short, 2-3 mm long 24.
 + Hairs on the awn 4-7 mm long 25.
24. Ligule to 4 mm long; the lower segment of the awn sharply scabrous,
 the upper segment arched, plumose, with hairs ca. 2 mm long
 20. *S. Hohenackeriana* Trin. et Rupr.
 + Ligule very short, obsolete; lower part of awn naked, smooth, the up-
 per part flexuous, plumose, with hairs ca. 3 mm long
 21. *S. Lessingiana* Trin. et Rupr.
25. Lemma 10-16(-18) mm long, nearly always with distinctly separated
 dorsal bands of hairs; species of Central Asia and south-western
 Altai 26.
 + Lemma (14-)16-22(-26) mm long, with more or less coalescent dorsal
 bands of hairs 29.
26. Awn 8-12(-16) cm long, scabrous below; only in Shugnan
 22. *S. turkestanica* Hack.
 + Awn 14-28 cm long, always smooth below 27.
27. Leaves very thin, 0.3-0.4 mm in diameter, minutely hairy
 23. *S. trichoides* P. Smirn.
 + Leaves 0.5-0.7 mm in diameter, glabrous on the outside, sometimes
 scabrous, but hairless 28.
- 82 28. Lemma 12-14(-15) mm long; ligule on leaves of sterile shoots (3-) 4-7
 (-12) mm long 25. *S. kirghisorum* P. Smirn.
29. (25). Ligule on leaves of sterile shoots very short, 0.2-0.3 mm in
 length, almost obsolete 26. *S. stenophylla* Czern.
 + Ligule on leaves of sterile shoots always distinct, 0.5-4 mm long. 30.
30. Lemma with a marginal band of hairs terminating 2-3 mm from the
 summit 31.
 + Lemma with a marginal band of hairs extending right up to the summit
 of the lemma, rarely terminating just below it 34.
31. Leaves glabrous, smooth or scabrous on both sides, but always hair-
 less on the outer (lower) side 32.
 + Leaves covered on the outside with minute, semiappressed, setiform
 hairs, and hence sharply scabrous 33.
32. Young leaves terminating in a tassel of hairs, to 3 mm long, which
 later fall off readily; glumes 3-5 cm long; lemma (15)16-17(-21) mm
 long 27. *S. Joannis* Cel.
 + Young leaves without tassels of hairs at apex; glumes 7-8 cm long;
 lemma 19-21 mm long 29. *S. araxensis* Grossh.
33. Leaves short-pubescent on the inside; glumes 4.5-6.5 cm long;
 awn with hairs 5(6) mm long. 30. *S. ucrainica* P. Smirn.
 + Leaves glabrous on the inside; glumes 7.29-9.7 cm long; awn with
 hairs ca. 7 mm long
 31. *S. Krascheninnikowii* Roshev.
34. Leaves glabrous, smooth or scabrous on both sides, always hairless
 on the outer (lower) side 35.
 + Leaves with minute, semiappressed, setiform hairs on the outside,
 hence very sharply scabrous 37.
35. Lower part of awn scabrous, straw-yellow-colored on mature fruits;
 lemma 16-17 mm long. Crimea ... 32. *S. lithophila* P. Smirn.

- + Lower part of awn smooth, chestnut-colored on mature fruits; lemma 19-25 mm long 36.
- 36. Sheaths of culm leaves smooth, ciliate on the margin when young; ligule naked or almost naked on the back 33. *S. pulcherrima* C. Koch.
- 83 + Sheaths of culm leaves pubescent; culm softly pubescent above; ligule hairy on the back, long-ciliate on the margin. Kopet Dag 35. *S. crassiculmis* P. Smirn.
- 37. Leaves covered on both sides with long, soft hairs, to 1.2 mm long, more or less flat in live state 36. *S. dasyphylla* Czern.
- + Leaves covered on the outside with semiappressed, setiform hairs, to 0.36 mm long, or copiously papillose-strigose 38.
- 38. Lemma large, 20-23 mm long; awn very long, 40-50 cm in length. Kopet Dag 37. *S. turcomanica* P. Smirn.
- + Lemma 16-20(-21) mm long; awn not exceeding 40 cm in length ... 39.
- 39. Awn broadly plumose, with hairs to 7 mm long. Armenia 38. *S. canescens* P. Smirn.
- + Awn narrowly plumose, with hairs to 5 mm long 40.
- 40. The twisted segment of the awn, on ripe fruits, straw-yellow colored; leaf sheaths glabrous, usually not tinged 40. *S. pontica* P. Smirn.
- + The twisted segment of the awn, on mature fruits, chestnut colored; leaf sheaths minutely pubescent, usually purple-tinged 41. *S. Zaleskii* Wilensky.
- 41. (4). Awn pubescent or minutely ciliate throughout its length or on one of its parts, with hairs not exceeding 1 mm in length 42.
- + Awn naked throughout its length, rather sharply scabrous 49.
- 42. Awn with longer hairs on the twisted lower segment than on the upper segment 43.
- + Awn sharply scabrous or with shorter hairs on its lower segment than on its upper segment 44.
- 43. Annual or biennial plants, 10-30 cm tall; awns 6-10 cm long 42. *S. tortilis* Desf.
- + Perennials, 40-80 cm tall; awns 18-25 cm long 48. *S. holosericea* Trin.
- 44. Awn naked, sharply scabrous on its lower, twisted part 45.
- + Awn with minute hairs throughout its length 46.
- 45. Lemma ca. 10 mm long; awn 15-18 cm long. Lake Balkhash region. 43. *S. pseudocapillata* Roshev.
- + Lemma 16-17 mm long; awn 22-25 cm long. Eastern Transcaucasia 47. *S. gigantea* Lag.
- 46. Awn once-geniculate, with hairs ca. 0.3 mm long below and hairs to 0.6-0.7 mm long above. Only in Altai 44. *S. consanguinea* Trin. et Rupr.
- + Awn twice-geniculate 47.
- 84 47. Awn long, 18-20 cm. Aralo-Caspian region 45. *S. Spiridonovii* Roshev.
- + Awn not exceeding 12 cm in length 48.
- 48. Glumes relatively short, 12-16 mm; lemma 8-9 mm long 46. *S. Korshinskyi* Roshev.
- + Glumes relatively long, 30-35 mm; lemma 10-12 mm long 49. *S. daghestanica* (Westb.) Grossh.

49. (41). Lemma 4.5-5.5 mm long; awn to 7 cm long 50. *S. Bungeana* Trin.
 + Lemma 6-7(-8) mm long; awn 5-7 cm long 54. *S. densiflora* P. Smirn.
 ++ Lemma 8-16 mm long; awn (8) 10-27 cm long 50.
 50. Lemma 15-16 mm long; awn 24-27 cm long 51. *S. grandis* P. Smirn.
 + Lemma 9-14 mm long; awn to 18(-20) cm long 51.
 51. Leaves pubescent on the upper (inner) side 52.
 + Leaves glabrous on the upper (inner) side 53.
 52. Lemma without a crown of hairs below the awn 52. *S. capillata* L.
 + Lemma with a crown of hairs below the awn. Eastern Siberia and Far East 53. *S. baicalensis* Roshev.
 53. The upper segment of the awn slopingly arched. Only in Fergana ... 55. *S. margelanica* P. Smirn.
 + The upper part of the awn flexuous 54.
 54. Leaves more or less covered with minute setiform hairs 56. *S. sareptana* Becker.
 + Leaves glabrous, smooth, rarely somewhat scabrous on the outside 57. *S. Krylovii* Roshev.

Series 1. *Sibiricae* Roshev. - Glumes lanceolate-pointed. Lemmas only slightly shorter than the glumes, with awn to 2 cm long.

1. *S. Regeliana* Hack. in Sitzb. Akad. Wien, LXXXIX (1884) 130. - *Stipa dshungarica* Roshev. (nomen) in B. Fedchenko, Rast. Turkest. (Plants of Turkestan) 1915) 90.

Perennial. Forming small tufts; culms 15-40 cm tall, glabrous, almost leafless in upper part; leaves thin, setaceous-involute, somewhat scabrous; radical leaves 5-11 cm long, those of the culm 2-3 cm; ligule 2-3 mm long, oblong. Inflorescence 5-10 cm long, with short branches, narrow, contracted, not dense; spikelets elongate-lanceolate, more or less purple-tinged; glumes subequal, 9-14 mm long, lanceolate-pointed, hyaline on the margin; lemma 6-8 mm long, dark brown, long-pubescent (to 1 mm), terminating in a twice-geniculate awn pubescent below, 15-20 mm long. June-July. (Plate VI, Figure 27-32).

85 Mountain slopes and alpine meadows. - Centr. Asia: Dzung. - Tarb., Tyan'-Shan. Described from the Muzart Pass. Type in Vienna.

2. *S. sibirica* (L.) Lam. III 1 (1791) 158; Griseb. in Ldb. Fl. Ross. IV 448. - *Avena sibirica* L. Sp. pl. (1753) 79. - *Stipa confusa* Litw. in Bull. Acad. Sc. URSS (1928) 55. - Ic.: Litw. in Bull. Acad. URSS (1928) 50, fig. I, II, III, 1.

Perennial. Tufted; rhizomes short-creeping; culms to 1 m tall, erect, glabrous, smooth; leaves narrow, long, involute, more rarely flat, smooth or scabrous; ligule short, obtuse. Panicle oblong, 10-30 cm long, many-flowered, often 1-sided; spikelets linear-lanceolate, 8-10 mm long, more or less purple-tinged; glumes membranaceous, 3-nerved, equal, glabrous; lemma slightly shorter than the glumes, 3-nerved, densely pubescent all over and long-pubescent below the awn, with a short callus at base; awn 15-20 mm long, twice-geniculate, naked or minutely pubescent below. June-July. (Plate VI, Figures 22-26).

Steppes and steppe meadows, stony slopes, and edges of forest. - Caucasus: Dag. (around Dargin Lake); West. Siberia: Ob. (eastern part),

Irt., Alt. East. Siberia: all regions; Far East: Ze.-Bur., Ussur. (infrequently), Sakhal. Gen. Distr.: Mong., Jap.-Chin. Described from Siberia. Type in London.

ECONOMIC IMPORTANCE. Before flowering readily eaten by cattle.

3. *S. effusa* (Maxim.) Nakai ex Honda in Tokyo Bot. Mag. XL (1926) 310. -*Stipa sibirica* var. *effusa* Maxim. Prim. fl. amur. (1859) 326; Komarov, Fl. Mandsh. I (1900) 267. -*Stipa pekinensis* Matsudaira et Ikeno (non Hance) in Tokyo Bot. Mag., VIII (1894) 424. -Ic.: Litw. In Bull. Acad. Sc. URSS (1928) 55, fig. 1, III, 3.

Perennial. Growing in small tufts; culms to 2 m tall, erect, glabrous, smooth; leaves linear, flat, 7-12 mm broad, scabrous on the margin underneath; ligule short, obtuse. Panicle broadly diffuse, 20-45 cm long, with long branches; spikelets 8.5-9 mm long, narrowly lanceolate, whitish-green; glumes subequal, glabrous; lemma ca. 6 mm long, sparsely covered with hairs, with crown of longer hairs below the awn; awn to 18 mm long, arched, slightly twisted and pubescent below, scabrous above. July-August.

Borders of streams and rocky crests. -East. Siberia: Daur.; Far East: Ze.-Bur., Ussur. Gen. Distr.: Jap.-Chin. Described from Amur. Type in Leningrad.

Series 2. *Brevigeniculatae* Roshev. -Awn once-geniculate, the lower, twisted part 1/10-1/8 as long as the upper part. Occurs only in Central Asia.

4. *S. aktauensis* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 302. -*Stipa lingua* var. *minor* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 146. -*S. deserti* M. Pop. in litt.

- 86 Perennial. Forming dense tufts; culms 25-30 cm tall, minutely pubescent; leaf sheaths sharply scabrous, very short-pubescent, the terminal one expanded, enveloping the inflorescence; leaves narrow, setaceous-involute, pubescent on the inside, scabrous or short-appressed-hairy on the outside; ligule very short, long-ciliate. Inflorescence 6-10 cm long, loose; glumes subequal, terminating in a long point, 4-4.5 cm long; lemma 10-12 mm long, with a sharp, naked callus ca. 0.7-0.8 mm long, at the very base with rows of hairs not reaching to the summit of the lemma, and with a crown of long cilia below the awn; awn ca. 13.5 cm long, geniculate at the height of 1.5 cm, twisted below, plumose all the way up; plume hairs 4-5 mm long, becoming shorter and eventually disappearing toward the summit.

Dry mountain slopes. -Centr. Asia: Syr-Dar. Endemic. Described from Aktau, between town of Turkestan and Petroaleksandrovsk [Turkui]. 6 May 1916, No 219 (S. Filatov). Type in Leningrad.

5. *S. lingua* Junge in Bull. Jard. Bot. Pétersb. X (1910) 129, tab. V.

Perennial. Growing in bunches or small tufts; culms 25-50 cm tall, with rather short and stiff hairs below the nodes; sheaths of radical leaves short, those of culm leaves very long, open, minutely and copiously pubescent; leaves short, setaceous-involute, those of the culm shorter than the radical leaves; ligule short, pilose. Inflorescence 10-17 cm long, narrow, contracted, enveloped in the sheath of the terminal leaf; glumes subequal, membranaceous, long-acuminate, 7-9 cm long; lemma 14-16 mm long, with bent, ca. 2 mm long, naked callus, at base with row of hairs not reaching up to the summit of the lemma, and a crown of long hairs below the awn; awn 18-20 cm long, once geniculate at the height of ca. 2 cm, twisted below, plumose all the way up, but hairs sparser and shorter on the lower

segment than on the upper segment, where they attain 8 mm in length. May-June.

On dry slopes of low mountains. -Centr. Asia: Upp. Turkm. Endemic. Described from Germab. Type in Leningrad.

6. *S. magnifica* Junge in Bull. Jard. Bot. Pétersb. X (1910) 128, tab. IV.

Perennial. Growing in small tufts; culm 50-90 cm tall, scaberulous below the nodes, leafy; leaf sheaths shorter than the internodes, ciliate on the margin; leaves long, the radical ones usually setaceous-involute; ligule short, pilose; inflorescence ca. 20 cm long, contracted; glumes subequal, long-acuminate, ca. 7 cm long; lemma 14-16 mm long, with a short, naked callus, with dense hairs at base, and higher up with row of hairs, of which the outer ones reach up to the summit of the body, and with a crown of long cilia below the awn; awn 23-27 cm long, once-geniculate at 1/10 of its length, 87 plumose all the way up. Plume hairs shorter on the twisted lower segment of the awn than on the upper segment where they attain 7 mm in length. June.

Rocks. -Centr. Asia: Syr-Dar. Described from the environs of Gul'cha (near Osh). Type in Leningrad.

7. *S. Ovchinnikovii* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. II 2 (1934).

Perennial. Densely tufted; culms 25-35 cm tall, densely short-pubescent below the nodes, ascending; leaf sheaths glabrous, the lower ones shorter than internodes, the upper ones dilated, enveloping the inflorescence; leaves narrowly linear, setaceous-involute, only just attaining half the length of the culm, glabrous, smooth on the outside, pubescent on the inside; ligule short, pilose; inflorescence ca. 10 cm long, narrow, contracted, loose; spikelets narrowly linear, whitish; glumes long-acuminate, to 7 cm long, subequal, membranaceous; lemma 12-13 mm long, with a bent, naked callus, ca. 1.5 mm long, with 7 rows of hairs, of which the outer ones reach the awn and the others up to 4/5 of the length of the lemma, and with a crown of rather long hairs below the awn; awn 15-20 cm long, once-geniculate at the height of ca. 2 cm, twisted below, with plumosity of equal density all the way up, the barbs of the plume ca. 8 mm long.

In mountain steppes. -Centr. Asia: Pam. -Al. (Tadzhikistan: Zeravshan. Crest towards the valley of Zeravshan, in the region of the village Syuzhen. 3 June 1932, No 144. P. Ovchinnikov). Endemic. Type in Leningrad.

8. *S. Lipskyi* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 153.

Perennial. Forming fairly dense tufts; culms 30-50 cm tall, pubescent only below the nodes; leaf sheaths longer than the internodes, glabrous, ciliate on the margin, the uppermost leaf enveloping the inflorescence; leaves setaceous-convolute, glabrous, smooth on the outside, pubescent on the inside, reaching half the height of the culm; ligule short, long-ciliate; inflorescence 10-20 cm long, narrow, loose; glumes subequal, tapering to a long, thin point, 6.5-7.5 cm long. Lemma 13-15 mm long, with a callus to 2 mm long and bent sideways, densely pubescent below, above with 7 rows of hairs, of which the outer ones reach up to the summit, and with a crown of sparse hairs just below the awn; awn 17-21 cm long, geniculate at the height of 2-3 cm, naked on the twisted lower segment, plumose, straight above, with plume hairs to 7 mm long. May-June.

Dry slopes. -Centr. Asia: Syr-Dar., Pam. -Al. Endemic. Described from Samarkand. Type in Leningrad.

9. *S. longiplumosa* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. II, 2 (1934).

Perennial. Densely tufted; culms 30-40 cm tall, more or less erect, 88 glabrescent, scabrous, puberulent below the nodes; leaf sheaths glabrescent, scabrous, shorter than the internodes, the upper ones enlarged, enveloping the inflorescence; leaves narrowly linear, setaceous-involute, glabrescent, scabrous, glabrous on the inner (upper) side, attaining one-half of the height of the culm; ligule short, ciliate. Inflorescence ca. 10 cm long, few-flowered, contracted, short-branched; spikelets narrow, long, whitish; glumes 6-8.5 cm long, about equal, linear-lanceolate, long-acuminate, thin-hyaline above; lemma 13-14 mm long, with a bent callus, ca. 2 mm long, with 7 rows of hairs, of which the two outer ones reach up to 3/4 and the others up to 1/2 the height of the lemma, and with few hairs below the awn, at the juncture of the margins of the lemma. Awn 20-23 cm long, geniculate at the height of 4-5 cm, glabrous and smooth under the bend, the upper segment straight, broadly plumose, with hairs 9-11 mm long, gradually becoming shorter toward the summit.

Mountain slopes. -Centr. Asia: Pam. -Al. Endemic. Described from Tadzhikistan (Sarsaryak Crest, eastern slope, peaks below Morgak, 7 June 1932, No 227. N. Goncharov and Yu. Grigor'ev). Type in Leningrad.

10. *S. karataviensis* Roshev. in Tr. pochv. -bot. eksp. Peres. Upr. Bot. issl. (Proc. Soil and Botanical Expedition of the Resettl. Dep., Bot. Invest.) 1909, No VI (1912) 186, with plates. -Stipa Androssovi Litw. in herb. -K. karatavskii [of Karatau].

Perennial. Forming small tufts; culms 20-30 cm tall, glabrous or puberulent below the nodes, leafy; sheaths shorter than the internodes, glabrous, the radical ones ciliate on the margin; leaves narrow, setaceous-involute, glabrous; ligule short, pilose. Inflorescence 6-8 cm long, narrow, contracted, with 7-10 spikelets, usually covered by the sheath of the terminal leaf; spikelets narrowly lanceolate, whitish, on somewhat pubescent pedicels; glumes lanceolate, 3-3.5 cm long, equal; lemma 8-9 mm long, callus 1 mm long, naked, sideward-bent; callus with a single row of dense hairs, to 2 mm long, on the back, reaching up to 3/4 of its length and similar rows of hairs on the margins; otherwise quite naked; awn 8-9 cm long, once-geniculate, naked and twisted below, plumose above the bend, May-July.

Stony mountain slopes. -Centr. Asia: Tyan'-Shan. Endemic. Described from the Karatau Crest. Type in Leningrad.

11. *S. tianschanica* Roshev. in Fl. Az. Rose. (Fl. As. Russ.) XII (1916) 149.

Perennial. Forming small tufts; culms 17-23 cm tall, glabrous, sometimes pubescent under the nodes; leaf sheaths glabrous, the lower ones shorter than the internodes, the upper ones longer, enveloping the inflorescence; leaves setaceous-involute, glabrous; ligule ca. 1 mm long, pubescent on the margin. Inflorescence ca. 5 cm long; narrow; glumes subequal, long-acuminate, ca. 27 mm long, glabrous. Lemma 7-8 mm long, with a pubescent callus and rows of hairs reaching up to the base of the awn, where they form a crown of longer hairs; awn ca. 7 cm long, once-geniculate at an 89 most right angle, resilient, sharply scabrous on the twisted lower segment, plumose above, the hairs of the plume becoming progressively shorter toward the summit of the awn. June-July.

Stony slopes. - Centr. Asia: Tyan'-Shan. Endemic. Described from the lower reaches of the Ak-shiryak River (formerly Przhival'sk County). Type in Leningrad.

Series 3. *Barbatae* Roshev. - Awn once or twice geniculate, hairy throughout its length.

12. *S. caucasica* Schmalh. in Ber. d. Deutsch. Bot. Ges. X (1892) 293; Shmal'g. Fl. II, 595. - *S. orientalis* auct., ex parte. - *S. orientalis* var. *grandiflora* Rupr. in Osten-Sacken et Rupr. Sert. Tiansch. (1869) 35. - *S. orientalis* var. *trichoglossa* Hack. ex Paulsen in Kjoeb. Vidensk. Meddel. (1903) 164. - *S. bella* Drob. in Fedde, Repert. sp. nov. XXI (1925) 37. - Exs.: Edit. Horti Bot. Petri Mag. No. 51.

Perennial. Forming small, compact tufts; culms 20-40 cm tall, more rarely 7-15 cm (*f. desertorum* Roshev.) or (*f. robusta* Roshev.), usually puberulent; leaf sheaths shorter than the internodes, the radical ones usually puberulent, ciliate on the margin, the uppermost sheaths enveloping the inflorescence; leaves setaceous-involute, more rarely somewhat unrolled, glabrous, smooth; ligule short, shaggy. Inflorescence short, 5-10 cm in length, slightly exserted; glumes subequal, long-acuminate, 2.5-5 cm long; lemma 9-12 mm long, with a long, naked callus, entirely pubescent below, with 7 rows of hairs reaching up to the summit, and with a ciliate crown just below the awn; awn 8-13 cm long, more rarely 4.5-5.5 cm (*f. breviaristata* Roshev.), once-geniculate, plumose all the way up, with short hairs on the twisted lower segment, with longer hairs, up to 6 mm above. April-June. (Plate VII, Figures 1-6).

Dry slopes, mounds, gravelly plains, sand dunes, foothills, and mountains up to 1,000 m. - Caucasus: Ciscauc., Dag., East. Transcauc.; West. Siberia: Alt.; Centr. Asia: all regions. Gen. Distr.: Iran, Dzung. - Kshag., Mong. Described from northern Caucasus. Type in Kiev.

ECONOMIC IMPORTANCE. Needlegrass of secondary importance as fodder; unsuitable for hay cutting on account of restricted growth, while in pasture it is eaten only in early spring.

13. *S. glareosa* P. Smirn. in Fedde, Repert. spec. nov. XXVI (1929) 266. - *S. caucasica* f. *dasyphylla* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 142.

90 Perennial. Forming small, compact tufts; culms 12-15 (-30) cm tall, usually geniculate-ascending, finely velutinous below the nodes; leaf sheaths shorter than the internodes, ciliate on the margin, those of lower leaves puberulent, more rarely glabrous, those of upper leaves glabrous, scaberulous, more rarely also pubescent (*f. pubescens* P. Smirn.); leaves rather sharply scabrous, their lower part covered throughout with short, semiappressed, setiform hairs; ligule short, pointed, pilose-pubescent. Inflorescence short, enveloped in lower part by the sheath of the upper leaf; glumes subequal, 2-3 cm long, long-acuminate; lemma 8-9 mm long, the slightly bent callus, uniformly pubescent below, above with rows of hairs, all (or most) of which reach up to the summit of the lemma, where they form a crown of long hairs below the awn; awn 5.5-7 cm long, once-geniculate, plumose all the way up, on lower, the hairs on the twisted segment usually shorter than on the upper segment, where they attain 3-5 mm in length. July-August.

Gravelly steppes and stony slopes. - West. Siberia: Alt.; Centr. Asia: Pam. - Al. Gen. Distr.: Mongolia. Described from Hangai (Mongolia). Type in Leningrad.

14. *S. orientalis* Trip. in Ldb. Fl. alt. I (1829) 83; Griseb. in Ldb. Fl. Ross. IV, 449; Kryl. Fl. Zap. Sib. (Fl. west. Sib) II, 168 -Ic.; Ldb. Ic.:pl. Fl. Ross. tab. 223.

Perennial. Densely tufted; culms 25-30 cm tall, more rarely 6-20 cm (var. *humilior* Kryl.), glabrous, smooth; leaf sheaths slightly shorter than the internodes, the uppermost usually enveloping the lower part of the inflorescence, more rarely failing to reach it (var. *eleutherantha* Trautv.); leaves setaceous-involute, sharply scabrous; ligule long-acuminate, 2-3 mm long; inflorescence 5-10 cm long, contracted; glumes subequal, long-acuminate, 1.5-2.2 cm long; lemma 6-8 mm long, densely pubescent below, above with rows of hairs reaching up to or almost up to the summit of the lemma, with a crown of hairs below the awn; awn 4.5-6 cm long, twice-geniculate, twisted and short-hairy below, plumose, with hairs 3-4 mm long above. April-July. (Plate VII, Figure 7-12).

Dry, gravelly steppes and stony mountain slopes. -West. Siberia: Upp. Tob., Alt.; East. Siberia: Ang.-Sayan.; Centr. Asia: Aral.-Casp. Pribalkh., Dzung.-Tarb., Syr-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: Dzung.-Kashg., Mong., Tibet. Described from Altai. Type in Leningrad.

ECONOMIC IMPORTANCE. Eaten willingly enough by livestock in spring, but of no economic importance, as it never occurs in sufficiently large concentrations.

15. *S. Richteriana* Kar. et Kir. in Bull. Soc. Nat. Mosc. (1841) 862; Griseb. in Ldb. Fl. Ross. IV, 449. -S. Woronini Krassn. in Script. Horti Universitatis Petrop. II, 1 (1887-88) 22.

Perennial. Forming small, compact tufts; culms 30-75 cm tall, erect, more or less pubescent below the nodes; leaf sheaths similarly pubescent; leaves glabrous or pubescent (var. *dasyphylla* Roshev.), the culm leaves much shorter than the radical ones; ligule short, ciliate. Inflorescence 10-30 cm long, loose, interrupted, contracted; spikelets 10-13 mm long; 81 glumes lanceolate, apiculate, the lower glume slightly longer than the upper glume; lemma 6-7.5 mm long, hairy, with a ciliate crown just below the awn; awn 4-6 cm long, twice-geniculate, twisted below, pubescent all the way up. May-June.

Clayey, stony, and solonchaks sites in steppes, and low mountain slopes. -West. Siberia: Irt.; Centr. Asia: Aral.-Casp. Pribalkh., Kyz.-Kum. (northern part). Endemic. Described from Arganata Mountains. Type in Leningrad.

ECONOMIC IMPORTANCE. A needlegrass of secondary importance; eaten less readily than the plumose needlegrasses.

16. *S. breviflora* Griseb. in Goett. Nachr. (1886) 82. -*Stipa Aliciae* Kanitz, Pl. exped. Szech. As. centr. coll. (1891) 61, tab. VII, 2, fig. 4.

Perennial. Densely tufted; culms 20-45 cm tall, glabrous, smooth; leaf sheaths more or less pubescent, short, those of the culm glabrous, long, enveloping the lower part of inflorescence; leaves narrowly linear, setaceous-involute, glabrous; ligule on radical leaves short, obtuse, pointed, to 2 mm long, on culm leaves. Inflorescence loose, contracted, 15-25 cm long; spikelets small, elongate-lanceolate, whitish or somewhat purple-tinged; glumes 10-15 mm long, long-pointed, brittle at the summit; the lower glume somewhat longer than the upper glume; lemma 5-7 mm long, pubescent at base, glabrous at the middle, with a band of cilia along the margins, with hard bristles toward the summit and a crown of fairly long

hairs below the awn; awn 5.5-8 cm long, slender, brittle, twice-geniculate, minutely plumose all the way up, twisted below. June-August.

Growing in clayey steppes, ascending up to 3,000 m into the mountains. - Centr. Asia: Tyan'-Shan (eastern part). Gen. Distr.: Dzung. - Kashg. Mong. Described from West. Tibet (Nari-Khorsum Provinces, collected by Schlagintweit).

17. *S. Szowitsiana* Trin. in Hohen. Enum. Talysh in Bull. Soc. Nat. Mosc. (1838) 243; Griseb. in Ldb. Fl. Ross. IV, 450. - *Stipa barbata* auct. fl. ross. (non Desf.). - *S. caspia* C. Koch. in Linnaea XXI (1848) 440. - *S. barbata* var. *Szowitsiana* Hack. in Denkschr. Acad. Wien. I (1889) 8. - *S. Koenigii* G. Wor. in Not. syst. ex Herb. Horti Petrop. V (1926) 61. - *S. Prilipkoana* Grossh. in Tr. Geobot. obsl. Pastb. SSR. Azerbaidzhana (Proc. Geobot. Invest. Pastures of Azerbaijan SSR) II (1929) 56. - Exs.: HFR No 1449; Herb. Fl. Cauc. No 105, 106. - K. Shovitsa.

Perennial. Tufted; culm 35-70 cm tall, glabrous or more or less pubescent, especially below the nodes. Leaf sheaths shorter than internodes, the lower ones usually short-pubescent, more rarely glabrous or long-pubescent (var. *incana* Roshev.); leaves revolute, more rarely flat (var. *platyphylla* Hack.), pubescent on the inside, on the outside scabrous or with silvery pubescence (var. *incana* Roshev.); ligule elongate, to 5 mm long. Inflorescence narrow, few-flowered; glumes subequal, long-acuminate, 2.5-3.5 cm long; lemma 10-12, more rarely 9 mm long (var. *Meyeriana* Trin. et Rupr.), with a rather long, pointed, naked callus, indistinct rows of hairs not reaching up to the summit, and a crown of hairs below the awn. Awn 10-20 cm long, more rarely 7-10 cm (var. *Meyeriana* Trin. et Rupr.), twice-geniculate, plumose all the way up (with hairs ca. 2 mm long), twisted below. May-June.

Dry mountain slopes and foothills. - Caucasus: all regions (except Cis-cauc.); Centr. Asia: all regions. Gen. Distr.: Arm. - Kurd., Iran, Dzung. - Kashg. Described from Talysh. Type in Leningrad.

ECONOMIC IMPORTANCE. Resembling *S. capillata* L. in nutritive value, but eaten less readily.

18. *S. armeniaca* P. Smirn. sp. nov. in Addenda p. 740.

Perennial. Densely tufted; culms 30-50 cm tall, glabrous, smooth, few in number; leaf sheaths longer than the internodes, glabrous, smooth, or the lower ones minutely pubescent, ciliate on the margin, the uppermost enveloping the lower part of inflorescence; leaves setaceous-involute, glabrous, smooth; ligule to 1 mm long, blunt. Inflorescence narrow, contracted; glumes subequal, long-acuminate, 3.5-4.5 cm long; lemma 10.5-11.5 mm long, with a slightly bent, naked callus, uniformly pubescent below, above with 5 rows of hairs not reaching up to the summit, with a crown of longer hairs below the awn; awn 14-18 cm long, obscurely twice-geniculate, twisted below, arched above, plumose-pubescent all the way up, with hairs to 1 mm long in lower part and to 2 mm long in upper part.

Stony slopes and mounds. - Caucasus: South. Transcauc. Gen. Distr.: Arm. - Kurd. Described from Kagyzman. District. Type in Leningrad.

Series 4. Pennatae Roshev. - Awn twice-geniculate, naked, smooth or scabrous below, plumose above.

19. *S. gracilis* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 151.

Perennial. Small tufts; culms 25-35 cm tall, glabrous, leafy; leaf sheaths shorter than the internodes, glabrous, smooth; leaves thin, setaceous -

involute, the radical ones short, scabrous, those of the culm smooth; ligule ca. 2 mm long, pointed, naked. Inflorescence 5-10 cm long, exerted high above the sheath of uppermost leaf, narrow, loose; spikelets greenish; glumes subequal, long-acuminate, ca. 1.5 cm long; lemma ca. 7 mm long, with callus naked below densely hairy at base, higher up with rows of hairs reaching up to the middle of the lemma and summit naked below the awn; awn 4-5(-7) cm long, twice-geniculate, twisted and scabrous below, plumose above. July.

Stony mountain slopes. -Centr. Asia: Tyan'-Shan. Endemic. Described from Alexander [Kirgiz] Range, Chamaldy Pass, 1915 (M. Spiridonov). Type in Leningrad.

20. *S. Hohenackeriana* Trin. et Rupr. in Mém. Acad. Pétersb., sér. 6, VII 2 (1842) 80. -*S. pennata* β *minor* Boiss. Fl. Or. V (1884) 502. -*S. subbarbata* Keller in Bot.-geogr. issl. v Zaisansk. u. Semipalat. obl. [Bot.-Geogr. Invest. in the Zaisan County of Semipalatinsk Region] II (1912) 53.

Perennial. Small tufts; culm 30-80 cm tall, glabrous, pubescent under the nodes; leaf sheaths more or less scabrous or scabrous, the radical ones short, those of the culm long; leaves setaceous-involute, scabrous or puberulent on the outside, hairy inside; ligule to 4 mm long. Inflorescence 15-30 cm long, dense, contracted; glumes subequal, long-acuminate, 2-3.5 cm long; lemma 10-15 mm long, with a naked callus, uniformly pubescent below, above with rows of hairs not reaching the summit, and with a crown of hairs below the awn; awn 10-18 cm long, twice-geniculate, twisted, naked, sharply scabrous below the bend, arched, plumose above, hairs of the plume ca. 2 mm long. April-June.

Desert foothills and stony slopes. -Caucasus: East. and South. Transcauc. West. Siberia: Upp. Tob. (south-eastern part), Irt.; Centr. Asia: all regions. Gen. Distr.: Iran. Described from Transcaucasia. Type in Leningrad.

21. *S. Lessingiana* Trin. et Rupr. in Mém. Acad. Pétersb., sér. 6, VII, 2 (1842) 79; Griseb. in Ldb. Fl. Ross. IV 450; Shmal'g. Fl. II, 595; Kryl. Fl. Zap. Sib. (Fl. West Sib.) II, 176.

Perennial. Compact tufts. Culms 30-70 cm tall, numerous, glabrous; leaf sheaths longer than internodes, glabrous or velutinous (var. *Braunerii* Pacz.); leaves setaceous-involute, thin, more or less sharply-scabrous, the radical ones usually exceeding half the length of the culm; ligule very short, nearly obsolete. Inflorescence 10-20 cm long, narrow, contracted; glumes subequal, long-acuminate, 2.2-2.7 cm long; lemma 9-11 mm long, hairy right up or nearly up to the summit, with a crown of longer hairs below the awn; awn 12-20(-25) cm long, twice-geniculate, the second segment twisted, naked, the terminal segment plumose, with hairs ca. 3 mm long. April-May.

Steppes and stony slopes. -European part: Mid. Dnep. Volg.-Don., Zavolzh., Prichern., Crimea, Low. Don., Low. Volg. Caucasus: Ciscauc., Dag., East. and South. Transcauc.; West. Siberia: Upp. Tob. Irt., Alt.; Centr. Asia: Aral.-Casp., Pribalkh., Dzung.-Tarb., Upp. Turkm., Syrdar., Tyan'-Shan. Gen. Distr.: Centr. Eur., Iran (northern part). Described from the environs of Orenburg. Type in Leningrad.

ECONOMIC IMPORTANCE. Considered the best needlegrass as regards feed quality. It is readily eaten by horses, sheep, and goats alike; less

readily by cattle and unwillingly by camels. It is eaten in early spring and up to flowering time, and again in fall, with the appearance of new foliage. The hay is highly valued for horses, sheep, and goats; less willingly grazed in pasture by cattle. Average hay yield amounts to 500-600 centners per hectare, and in best years attains 1,200-1,500 centners per hectare.

22. *S. turkestanica* Hack. in A. H. P. XXVI (1906) 59. -*S. Lessingiana* var. *dubia* Hack. in herb.

- 94 Perennial. Small tufts; culms 25-40 cm tall, sharply scabrous, leafy almost to the top; leaf sheaths shorter than internodes, sharply scabrous; leaves narrow, setaceous-involute, hard, sharply scabrous, the radical ones long, attaining one-half the length of the culm; ligule ca. 3-5 mm long. Inflorescence 10-12 cm long, contracted, linear, enveloped below by the sheath of uppermost leaf; spikelets greenish; glumes ca. 3 cm long, tapering to a long point, 3-nerved; lemma 10-12 mm long, with a naked callus bent sideways, with rows of hairs reaching up to one-half the length of the body and up to 3/4 of its length on the margins, naked below the awn; awn 8-12 (-16) cm long, twice-geniculate, scabrous on the lower twisted segment, plumose above; plume hairs 4-5 mm long, disappearing at the summit. June-July.

Mountain steppes of the subalpine zone. -Centr. Asia: Pam.-Al. Endemic. Described from Shugnan, Kol-tezek-Dzilandy, 20 July 1901 (O. A. and B. A. Fedchenko). Type in Vienna and Leningrad.

23. *S. trichoides* P. Smirn. in Fedde, Repert, sp. nov. XXI (1925) 233.

Perennial. Dense tufted; culms 40-70 cm tall, slender, puberulent below the nodes; leaf sheaths shorter than the internodes, glabrous; leaves thin, involute, capillary, 0.3-0.4 mm in diameter, tough, sharply scabrous; ligule 1.5-4 mm long. Inflorescence to 20 cm long, narrow, contracted; spikelets whitish; glumes subequal, long-acuminate, 3-4.5 cm long; lemma 10-13 mm long, pubescent all over in lower part, above with 7 rows of hairs not reaching up to the summit, without a crown of hairs below the awn; awn 14-20 cm long, twice-geniculate, naked on the twisted lower segment, plumose above, with plume hairs ca. 5 mm long. June-July. (Plate VII, Figures 20-24).

Mountains. -Centr. Asia: Upp. Turkm., Pam.-Al. Endemic. Described from the environs of Askhabad, Ludzha Mountain, 9 July 1898 (D. Litvinov). Type in Leningrad.

24. *S. macroglossa* P. Smirn. in Not. Syst. Herb. Hort. Bot. Reipub. Ross. V (1924) 47 et in Fedde, Repert, sp. nov. XXI (1925) 234.

Perennial. Densely tufted, 3-10 cm in diameter; culms 30-40 cm tall, pubescent only below the nodes; leaf sheaths glabrous, shorter than the internodes, the lower ones ciliate on the margin, the uppermost glabrous, enveloping the inflorescence; leaves involute, 15-20 cm long, 0.5-0.7 mm in diameter, glabrous on the outside, densely covered with bristlelike papillae, hence sharply scabrous; ligule (3) 4-7(12) mm long. Inflorescence 10-15 cm long, narrow, contracted; glumes long-acuminate, the lower glume 5-5.5 cm long, the upper glume 4-4.8 cm long; lemma 12-14(15) mm long, with 5-7 rows of hairs not reaching up to the summit, without a crown of hairs below the awn; awn 17-28 cm long, twice-geniculate, the twisted lower segment naked, the upper segment plumose. June-July.

- 95 Dry steppes and stony slopes. -West. Siberia: Irt., Centr. Asia: Aral. -Casp. (rarely), Pribalkh., Dzung. -Tarb., Tyan'-Shan. Endemic. Described from Turgai District. Type in Leningrad.

ECONOMIC IMPORTANCE. Approaching *S. Joannis* Cel. as regards feed value.

25. *S. kirghisorum* P. Smirn. in Fedde, Repert. sp. nov. XXI (1925) 232.

Perennial. Fairly large, very compact tufts; culms 30-60 cm long, glabrous, smooth, scaberulous only below the nodes; leaf sheaths longer than the internodes, glabrous, smooth or more less scaberulous; leaves almost as long as the culm, setaceous-involute, 0.5-0.7 mm in diameter, glabrous on the outside, densely covered with bristlelike papillae, hence sharply scabrous; ligule 0.5-1 mm long. Inflorescence 10-15 cm long, narrow, contracted; spikelets whitish; glumes subequal, long-acuminate, 3.5-5.5 cm long; lemma 14-16(-18) mm long, with 7 rows of hairs not reaching up to the summit, without a crown of hairs below the awn; awn 20-26 cm long, twice-geniculate, naked on its twisted lower segment, plumose above. June-July.

Steppes and steppe slopes. -West. Siberia: Irt., Alt. (?); Centr. Asia: Aral. -Casp., Pribalkh., Dzung. -Tarb., Syr-Dar., Pam. -Al., Tyan'-Shan. Gen. Distr.; Dzung. -Kashg. Described from Nura River (Akmolinsk Raion). Type in Leningrad.

ECONOMIC IMPORTANCE. Approaching *S. Lessingiana* as regards feed value.

26. *S. stenophylla* Czern. Consp. pl. Charc. (1859) 75. -*S. Tirsia* Celak. in Oest. Bot. Zeitschr. XXXIV (1884) 318 non Stev. -*S. pennata* stenophylla Lind. Fl. Chers. II (1882) 283 ex parte. -*S. obvoluta* Wyssotzky in sched. -*S. pennata* β *stenophylla* Pacz. Dikorast. zlaki Khers. gub. (Wild Grasses of Kherson Province). (1913) 19 ex parte. -*S. Schmidtii* G. Woron. in sched. et in Grossh. Fl. Kavk. (Fl. Cauc.) I (1928) 66.

Perennial. Dense tufts, to 15 cm across; culms 40-100 cm tall, glabrous, puberulent only below the nodes, shorter than or as long as the leaves; leaf sheaths glabrous; leaves folded, ca. 0.5 mm in diameter, sharply scabrous, 50-70(-100) cm long, tapering to a long, thin point; ligule on sterile shoots very short, obsolete. Inflorescence narrow, contracted, enveloped below by the sheath of upper leaf; spikelets whitish; glumes subequal, long-acuminate, 5-6.2 cm long, ciliate at the summit; lemma 18-20 mm long, pubescent all over in its lower part, above with 7 rows of hairs not reaching up to the summit, without a crown of hairs below the awn; awn 35-50 cm long, twice-geniculate, naked on its twisted lower segment, plumose above. June-July.

In meadow and upland steppes, sometimes in water meadows; shungs sands and saline soils. -European part: Mid. Dnep., Volg. -Don., Zavolzh., Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: Ciscauc., East and South. Transcauc.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral. -Casp., Pribalkh., Dzung. -Tarb., Kyz. -Kum., Tyan'-Shan. Gen. Distr.; Scand., Centr. Eur., Balk. -As. Min. Described from Kharkov District. Type in Leningrad.

ECONOMIC IMPORTANCE. Closely approaching *S. Joannis* Cel. as regards feed value.

27. *S. Joannis* Cel. in Oesterr. Bot. Zeitschr. XXXIV (1884) 318. - *Stipa pennata* var. *Joannis* Richt. Pl. Eur. I (1890) 32. - *S. pennata* auct. Pl. ross. ex parte. - *S. pennata* f. *penicillifera* Pacz. in Dikorast. zlaki Khers. gub. (Wild Grasses of Kherson Province) (1913) 23.

Perennial. Rather loose tufts; culms 30-100 cm tall, glabrous, below the nodes puberulent, smooth; leaf sheaths more or less equaling internodes, glabrous or ciliate; leaves narrowly lanceolate, 0.5-2 mm broad, more or less revolute, more rarely flat, glabrous, smooth or scaberrulous, acute, young leaves with a tassel of hairs to 3 mm long which later falls readily; ligule 0.7-3 mm long, oblong. Inflorescence narrow, contracted, with 6-20 spikelets; spikelets whitish; glumes subequal, long-acuminate, 3-5 cm long, ciliate or naked above; lemma (15) 16-17 (-21) mm long, below pubescent all over, above with 7 rows of hairs not reaching up to the summit; awn 25-35 mm long, twice-geniculate, in lower, twisted part naked, above plumose, with hairs about 5 mm long. April-June.

Steppes and dry slopes. - European part: Upp. Dnep., Mid. Dnep., Volg.-Don., Zavolzh., Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: Ciscauc., Dag., South. Transcauc.; West. Siberia: Upp. Tob., Irt., Alt.; East. Siberia: Ang.-Sayan.; Centr. Asia: Aral.-Casp., Pribalkh., Dzung.-Tarb., Kyz.-Kum., Tyan'-Shan. Gen. Distr.: Scand., Centr. Eur., Balk.-As. Min. Described from Austria. Type in Vienna.

ECONOMIC IMPORTANCE. Somewhat inferior to *S. Lessingiana* as regards feeding qualities, but also readily eaten by horses, sheep, and goats, both in spring pasture and as hay; less acceptable by cattle. Later, upon wilting, it becomes very coarse, and is no longer eaten by livestock. Hay yield about 900-1,000 kg per hectare.

28. *S. anomala* P. Smirn. sp. nova in Addenda p. 740.

Perennial. Forming rather dense tufts. Culms 50-60 cm tall, glabrous, smooth, puberulent below the nodes. Leaf sheaths slightly longer than the internodes, glabrous, scabrous, not ciliate on the margins. Leaves narrowly linear, to 2 mm broad, more or less involute, more rarely flat, glabrous, more or less sharply-scabrous, short-acuminate, the young leaves with a tassel of hairs to 3 mm long, later readily deciduous. Ligule 0.7-3 mm long, short-pointed. Inflorescence narrow, contracted, rather dense. Glumes subequal, long-acuminate, 3-4 cm long. Lemma 17-18 mm long, with a slightly bent, naked callus, to 1 mm long, pubescent all over in lower part, above with 7 rows of hairs not reaching up to the summit, without
97 a crown of hairs below the awn. Awn ca. 20-25 cm long, twice-geniculate, twisted below, arched above, plumose all the way up, the plume hairs ca. 4 mm long below, to 7 mm long above.

European part: Ural (Teplovka Raion, between Faduleev and Noven'kii farmsteads, in a pit in an elevated needlegrass steppe, 16 June, 1929, N. Burtsov). Endemic. Type in Leningrad.

29. *S. araxensis* Grossh. in Fl. Kavk. (Fl. Cauc.) I (1928) 68.

Perennial. Plant covered with a glaucous bloom, forming loose tufts. Culms 45-60 cm tall, more or less puberulent or scabrous. Leaf sheaths as long as internodes, scabrous; leaves 3-4 mm broad, flat or somewhat folded, sharply scabrous above, faintly scabrous and more glaucous underneath; ligule of lower leaves ca. 1-2 mm long, of upper ones to 8 mm long. Inflorescence ca. 10-15 cm long, narrow, contracted. Glumes subequal, long-acuminate, 7-8 cm long; lemma 19-21 mm long, with a naked callus, copiously hairy below, above with rows of hairs not reaching up to the awn;

awn 25-35 cm long, twice-geniculate, naked and smooth below, plumose above. June.

Stony slopes. -Caucasus: Transcauc. (Nakhichev.). Gen. Distr.: Arm. - Kurd. Described from the Kagyzman area. Type in Leningrad.

30. *S. ucrainica* P. Smirn. in Fedde Repert. sp. nov. XXII (1926) 374. -*S. Tirsia* Zalesky (an Stev. ?) in Not. Syst. Horti Petrop. (1924) 129 non Celak.

Perennial. A pale green or glaucous plant, forming dense tufts. Culms 30-60 cm tall, numerous, glabrous; leaf sheaths longer than the internodes, the uppermost enveloping the base of the panicle; leaves usually folded, 0.4-0.5 (0.6) mm in diameter, puberulent on the inside, sharply scabrous or covered with short bristlelike hairs on the outside, to 0.5 mm long; ligule on lower leaves 1-2 mm, on those of the culm 2-4 mm long. Inflorescence ca. 10-15 cm long, narrow, contracted; glumes equal, long-acuminate, 4.5-6.5 cm long; lemma (15) 17-19 (-21) mm long, pubescent all around at the base, above with 7 rows of hairs, of which the outer ones reach within 2-4 mm from the base of the awn; awn 30-40 cm long, twice-geniculate, naked and smooth on the twisted lower segment, plumose above, with hairs ca. 5 (-6) mm long. April-May. (Plate VII, Figures 13-19).

Steppes. -European part: Volg. - Don., Prichern., Crimea, Low. Don.; Caucasus: Ciscauc.; East. (?) and South. (?) Transcauc. Endemic. Described from Zaporozhie (formerly Aleksandrovsk.) Raion. Type in Moscow.

ECONOMIC IMPORTANCE. Approaches *S. Joannis* Cel. as regards feed value.

98 31. *S. Krascheninnikowii* Roshev. in Mat. Komiss. Eksped. Issled. Akad. Nauk, ser. Kazakstansk. (Mat. Commiss. Exped. Invest. Acad. Sci., Kazakhstan Series), V, (1928) 253. -*S. rubens* P. Smirn. ex parte.

Perennial. Dense, compact tufts; culm 30-35 cm tall, glabrous, smooth, puberulent only below the nodes; leaf sheaths longer than the internodes, not tinged, the lower sheaths puberulent, the upper ones glabrous; leaves 20-40 cm long, setaceous-involute, 0.4-0.6 mm in diameter, acuminate, scabrous on the inside, sharply scabrous or covered with semiappressed, bristlelike hairs on the outside; ligule 1.5-3 (-4) mm long, oblong, entire or serrate, not tinged. Inflorescence 8-12 cm long, enveloped in lower part by the sheath of terminal leaf; glumes unequal, very long-acuminate, the lower glume to 9.7 cm long, the upper one to 7.2 cm long; lemma (17) 18-20 (21.5) mm long, pubescent all round at the base, above with 7 rows of hairs not reaching up to the summit (this also applies to the outer rows); awn 35-40 (-45) cm long, twice-geniculate, marked on the twisted lower segment, plumose above, with plume hairs to 7 mm long. June-July.

Steppes. -Centr. Asia: Aral. -Casp. Endemic. Described from Baisara Valley, in the region of rivers Uil and Emba. Type in Leningrad.

ECONOMIC IMPORTANCE. It plays a secondary role from the economic point of view.

32. *S. lithophila* P. Smirn. sp. nova in Addenda p. 741. -*S. pulcherrima* f. *subtilis* Roshev. in sched. -*S. Tirsia* Stev. in Bull. Soc. Nat. Moscou XXX 2 (1857) 115, p. p.

Perennial. Small, compact tufts; culms 25-40 cm tall, glabrous, smooth; leaf sheaths longer than the internodes, very minutely pubescent below, ciliate on the margin when young; leaves setaceous-involute, more rarely

canaliculate, glabrous, smooth on the margin, more rarely scaberulous; ligule oblong, to 2 mm long. Inflorescence narrow, contracted, ca. 10 cm long; glumes subequal, long-acuminate, 4-6 cm long; lemma 16-17 mm long, with a slightly bent, naked callus, uniformly pubescent below, above with rows of hairs, of which the marginal rows reach up to the summit, while the middle one of the three dorsal rows is shorter than the lateral ones and amounts to approximately 1/4 of the length of the lemma; awn 17-22 cm long, twice-geniculate, the lower segment twisted and scaberulous, straw-yellow on mature fruits, the upper segments plumose, with plume hairs ca. 4 mm long. May-June.

Stony slopes. -European part: Crimea, in the mountainous part. Endemic. Described from Crimea. Type in Leningrad.

33. *S. pulcherrima* C. Koch in *Linnaea* XXI (1848) 440. - *S. Grafiana* Stev. in *Bull. Soc. Nat. Mosc.* XXX, 2 (1857) 116. - *S. pennata* β *Grafiana* Lindem. *Fl. Chers.* II (1882) 283; *Shmal'g. Fl.* II, 595. - *Fl. exs. Austro-Hungar.* No. 3987.

- 99 Perennial. Rather large tufts; culms 40-100 cm tall, few, glabrous; leaf sheaths longer than the internodes, glabrous, smooth, ciliate on the margin when young; leaves narrowly linear, ca. 3 mm broad, more or less involute, glabrous, smooth, more rarely scaberulous; ligule on lower leaves 0.8-1 mm, on upper leaves 2-3 mm long. Inflorescence to 15 cm long, narrow, contracted; glumes subequal, 6-8 cm long, long-acuminate; lemma 20-25 mm long, densely pubescent in lower part, above with 7 rows of hairs, of which the outer two reach up to the awn; awn 40-50 cm long, twice-geniculate, twisted and naked in lower part, plumose above, with plume hairs to 7 mm long. May-June.

Steppes, coppices, and dry, stony mountainslopes. -European part: Volg. -Don., Zavalzh., Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: Ciscauc., Dag., East. and South. Transcauc.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral, -Casp. (northern part), Pribalkh. (northern part) Upp. Turkm., Syr-Dar. (?). Gen. Distr.: Centr. Eur., Medit., Balk. - As. Min. Described from Transcaucasia. Type in Leningrad.

ECONOMIC IMPORTANCE. Eaten only in early spring, and not very readily. At one time the awns of this beautiful needlegrass were being exported abroad from the south-east of the European part of USSR, for dry bouquets and various decorations.

34. *S. paradoxa* (Junge) P. Smirn. *Tabl. dlya opred. kovylei* (Analytical Key to Needlegrasses) (1927) 7. - *S. Grafiana* var. (subsp.) *paradoxa* Junge ab (descr. Junge separatim edita). - *S. pennata* var. *schisensis* Westb. in *schedis*! - *S. schisensis* Roshev in *schedis*.

Perennial. Small tufts; short creeping rhizomes; culms 40-60 cm tall, glabrous; leaf sheaths longer than internodes, glabrous, ciliate on the margin; leaves narrow, 2-4 mm broad, usually involute, glabrous, smooth or scaberulous; ligule on radical leaves short, on those of the culm elongate. Inflorescence narrow, contracted, 10-12 cm long; glumes subequal, long-acuminate, 5-7 cm long; lemma 17-22 (25) mm long, with a long callus, densely pubescent in lower part, above with 7 rows of hairs, of which the outer ones reach up to the awn, without a crown of hairs below the awn; awn 25-40 cm long, twice-geniculate, broadly plumose in upper part, plume hairs to 5 mm long, twisted below, with copious, spreading, short hairs (ca. 1 mm long). April-June.

Dry hills and mountain slopes, and over limestone. -European part: Crimea; Caucasus: Ciscauc. Endemic. Described from Crimea (Koktebel', near Feodosiya. 16 May 1908. A. Yunge). Type in Leningrad.

35. *S. crassiculmis* P. Smirn. in Fedde, Repert. sp. nov. XXII (1926) 375.

Perennial. Large, dense tufts; culms thick, ca. 3-4 mm across (sheath included), in lower part, glabrous, in upper part soft-pubescent; leaf sheaths 100 longer than the internodes, glabrous, smooth or scaberulous, pubescent below the blade on the upper leaves; leaves setaceous-involute, ca. 1 mm thick, glabrous and sharply scabrous on both sides; ligule on lower leaves 1-2.5 mm long, on those of the culm 6 mm, pubescent, ciliate; glumes subequal, 7-9 cm long, glabrous; lemma 21-24 mm long, with 7 rows of hairs, of which the outer ones reach up to the awn; awn 34-40 cm long, twice-geniculate, twisted and naked in lower part, plumose above, with plume hairs ca. 7 mm long. July-August.

Mountain slopes. -Centr. Asia: Upp. Turkm., Kopet Dag (Arvaz Pass, 2,100 m, Korovin). -Endemic. Described from the place indicated. Type in Tashkent.

36. *S. dasyphylla* Czern. Consp. pl. Charcov. (1895) 75, nomen. - *S. pennata* Y *dasyphylla* Lindem. Fl. Chers. II (1882) 283. -*S. pulcherrima dasyphylla* Pacz. Dikorast. zlaki Khersonsk. gub. (Wild grasses of the Kherson Guberniye (1913) 23, diagn. - *S. pulcherrima* var. *hirsuta* Hand. -Mzt. in Fl. Exs. Austro-Hung. No 3988. -*S. villifolia* Simk. in sched. -Exs.: Fl. Exs. Austr. -Hung. No 3988.

Perennial. A grayish-green or glaucous-green plant, forming rather loose tufts; culms 30-80 cm long, with few leaves; leaf sheaths longer than the internodes, the lower ones pubescent, the upper ones glabrous; leaves as long as the culm, usually flat in live state, to 4 mm broad, revolute when dry, pilose on both sides; ligule on lower leaves 1-3 mm, on those of the culm 4-5 mm long. Inflorescence narrow, contracted, loose; glumes subequal, long-acuminate, 5-7 cm long, more or less tinged; lemma (18) 20-22(-24) mm long, pubescent all over at base, above with 7 rows of hairs, of which the outer 2 reach up to the awn, rarely failing to reach it by 1-1.5 mm; awn to 45 cm long, twice-geniculate, twisted, naked, and smooth in lower part, plumose above, with hairs 5-6 mm long. May-June.

Steppes, forest edges, coppices, and stony slopes. -European part: Volg. -Kam., Mid. Dnep., Volg. -Don., Zavolzh., Prichern., Low. Don., Low. Volg.; West. Siberia: Upp. Tob., Irt., Alt. (?). Gen. Distr.: Centr. Eur. Described from the Ukraine.

ECONOMIC IMPORTANCE. On account of the copious leaf pubescence, it is less readily eaten by livestock than other plumose needlegrasses.

37. *S. turcomanica* P. Smirn. in Fedde, Repert. sp. nov. XXI (1925) 234.

Perennial. Dense tufts; culms 50-75 cm tall, glabrous, somewhat longer than the internodes, the uppermost slightly enveloping the inflorescence, glabrous, smooth; leaves setaceous-involute, 0.5-0.8 mm in diameter, sharply scabrous, with hard, semiappressed hairs on the outside, pubescent on the inside; ligule on lower leaves 1-2 mm, on those of the culm 3-4 mm long. Inflorescence 10-15 cm long, contracted, narrow; glumes 100 subequal, long-acuminate, 6.5-9.5 cm long; lemma 20-30 mm long, below pubescent all over, above with 7 rows of hairs, of which the outer ones

reach up to the summit, and the others only up to $1/3-1/2$ of the lemma; awn 40-50 cm long, twice-geniculate, glabrous on the lower, twisted part, plumose above, with barb of plume ca. 6 mm long. May-June.

Mountain slopes. -Cntr. Asia: Upp. Turkm. Endemic. Described from the mountains Near Ashkhabad. Type in Leningrad.

38. *S. canescens* P. Smirn. sp. nova in Addenda p. 741.

Perennial. Tufted; culms 38-45 cm tall, glabrous, smooth; leaf sheaths longer than the internodes, glabrous, smooth or glaberrulous, the uppermost slightly enveloping the lower part of inflorescence; leaves setaceous-involute or partly canaliculate, pilose on the inside, covered with semiappressed, bristlelike hairs on the outside; ligule to 2 mm long, oblong, obtuse. Inflorescence narrow, contracted; glumes subequal, lanceolate, abruptly terminating in a thin, aristate point, 4.5-6 cm long; lemma 18-19 mm long, with a bent, naked callus to 1 mm long, pubescent all round in lower part, above with rows of hairs, of which only the outer ones reach up to the awn, glabrous in upper part, without a crown of hairs below the awn; awn 27-32 cm long, twice-geniculate, naked, twisted, almost smooth below, plumose above, with plume hairs to 7 mm long. July.

Caucasus: South. Transcauc. Endemic. Described from Armenia (Novo-Bayazet Raion, around Elenovka. 2 July 1929. O. Zedel'meier and T. Geideman). Type in Leningrad.

39. *S. Iljini* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS XXX (1932) 294.

Perennial. Forming dense tufts; culms 40-50 cm tall, glabrous, smooth; leaf sheaths longer than the internodes, the lower sheaths puberulent, the upper ones glabrous; leaves setaceous-involute, 15-25 cm long and 0.4-0.6 mm in diameter, sharply scabrous, more or less densely appressed-hairy on the outside, pilose on the inside; ligule 1-2 mm long on sterile shoots and 2-4 mm on leaves of the culm. Inflorescence 8-12 cm long, contracted, with hairy branches; glumes subequal, long-acuminate, ca. 2.5 cm long, glabrous; lemma 17-19 mm long, with 7 rows of hairs, of which the outer ones reach up to the summit, densely pubescent below, without a crown of hairs below the awn; awn 25-35 cm long, twice-geniculate, broadly plumose above (plume width 8-9 mm), twisted below, minutely hairy on the margins, the length of hairs decreasing toward the base of the awn. July.

Steppes. -West. Siberia: Irt. Described from Semipalatinsk Raion, around the village Znamenskoe, in sandy needlegrass steppe. 6 July 1928, No 387 (M. M. Il'in and A. O. Geinrikhsen). Type in Leningrad.

102 40. *S. pontica* P. Smirn. in Fedde, Repert. sp. nov. XXVI (1929) 268 et in Izv. Gos. Timiryaz. ins-ta (Rep. State Timiryazev Inst.) 1929, p. 1-3. -S. Tirsia Stev. in Bull. Soc. Nat. Mosc. XXX 2 (1857) 115, p. p. -*S. stenophylla* auct. p. p. (non Czern.). -*S. Grafiana* auct. pp. (non Stev.). -*S. pulcherrima* auct. p. p. non C. Koch.

Perennial. Compact tufts; culms 30-40 cm tall, glabrous, slightly exceeding the leaves; leaf sheaths longer than the internodes, glabrous; leaves 17-30 cm long, setaceous-involute, 0.5-0.7(-0.8) mm in diameter, covered with semiappressed hairs on the outside, also hairy on the lower part of the upper surface; ligule on lower leaves 0.5 mm long, on upper ones to 4 mm. Inflorescence 5-10 cm long, narrow, contracted, loose; glumes subequal, tapering to a long awn, 4-5.5 cm in length; lemma

16-18 mm long, uniformly pubescent below, above with 7 rows of hairs, of which the outer ones reach up to the summit; awn 28-40 cm long, twice-geniculate, twisted, naked, smooth, straw-colored below, plumose above, with hairs ca. 5 mm long. May-June.

Steppes and mountains slopes. -European part: Crimea; Caucasus: East. and South. Transcauc. Gen. Distr.: Balk. - As. Min., Arm. -Kurd. Described from Anatolia. Type in Leningrad.

41. *S. Zaleskii* Wilensky, in Dnevn. i Vseross. S'ezda russk. botanik. (Sitzungsber. d. I. Kongr. d. Russ. Bot.) (1921) 41. -*S. dasyphylla* var. *glabrata* P. Smirn. in Mittell. d. Zentr. Biol. St. I (1922) 2, pro parte. -*S. rubens* P. Smirn. in Fedde, Repert. sp. nov. XXI (1925) 231. -*S. glabrata* et *S. rubentiformis* P. Smirn. in Fl. Yugo-Vostoka, vyp. 2 (Fl. of the South-East, No 2) (1928) 115.

Perennial. Loose tufts; culms 30-75 cm tall, few, glabrous, smooth; leaf sheaths of culm leaves longer than the internodes, lower ones pubescent, upper ones glabrescent, usually purple-tinged; leaves more or less involute, 0.6-1 mm in diameter, more rarely 0.4-0.5 mm (*S. rubentiformis* P. Smirn.), strewn on the outside with prickly mamillae and scattered bristles, on the inside with short hairs not protruding from the groove, or with longer hairs protruding from the groove and appearing below the edges as a hairy line (*S. glabrata* P. Smirn.); ligule tridentate, ciliate, on sterile shoots 0.8-3 mm long, on culms 2-5 mm long. Inflorescence 7-15 cm long, loose; glumes subequal, long-acuminate, 5.5-6(-8.3) cm long. Lemma (16-)17-19(-21) mm long, pubescent all round at the base, above with 7 rows of hairs, of which the outer two reach up to the summit, more rarely 1-1.5 mm short of the summit; awn 20-35(-40) cm long, twice-geniculate, naked, smooth, on the lower, twisted part plumose above, with hairs ca. 5 mm long. May-June.

Steppes. -European part: Mid. Dnep., Volg. -Don., Zavolzh., Low. Don., Low. Volg.; West. Siberia: Upp. Tob., Irt., Alt.; East. Siberia: Ang. -Sayan.; Centr. Asia: Aral. -Casp., Pribalkh., Dzung. -Tarb. Endemic. Described from the neighborhood of Akmolinsk. Type in Leningrad.

ECONOMIC IMPORTANCE. Approaching *S. Joannis* Cel. as regards feed value.

Series 5. Tortiles Roshev. -Lower part of awn hairy, upper part naked, sharply scabrous.

42. *S. tortilis* Desf. Fl. Atl. I (1798) 99, tab. 31. -*S. Litwinowii* Drob. (non P. Smirn.) in herb. -Ic.: Desf. l.c.

Annual or biennial. Forms small tufts; culms 10-30 cm tall, numerous, erect or ascending, leafy, glabrous; sheaths of culm leaves longer than the internodes, upper sheaths glabrous, lower ones more or less hairy; leaves narrowly linear, more or less involute, glabrous or somewhat hairy. Inflorescence 3-5 cm long, dense, contracted, with a large number of spikelets; spikelets narrowly lanceolate, whitish-green; glumes subequal, hyaline, narrowly lanceolate, long-acuminate to a thin awn 1-2 cm long; lemma 5-7 mm long, pilose, with a crown of hairs below the awn and a densely pubescent callus; awn 6-10 cm long, twice-geniculate, twisted and hairy below, straight and sharply scabrous above. April-June. (Plate VI, Figures 48-51).

Sandy and stony mountain slopes. -Caucasus: East. Transcauc. (Apscheron Peninsula); Centr. Asia: Kara-Kum. (Krasnovodsk). Gen. Distr.: Medit. Described from North Africa. Type in Florence.

ECONOMIC IMPORTANCE. Presence of glucosides which give rise to prussic acid, has been established in this species (L. M. Krechetovich).

Series 6. *Pseudocapillatae* Roshev. - The upper non-twisted part of awn with minute hairs, to 0.7 mm long, the lower, twisted part naked, smooth, or sharply scabrous, or with short hairs.

43. *S. pseudocapillata* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 172.

Perennial. Forming small tufts; culm 60-70 cm tall, glabrous, smooth, pubescent only below the nodes; leaf sheaths shorter than the internodes, glabrous, the uppermost enveloping the lower part of inflorescence; leaves fairly long, setaceous-involute, sharply scabrous due to minute, stiff hairs; ligule ca. 1 mm long, obtuse. Inflorescence 17-25 cm long, narrow, contracted; glumes subequal, long-acuminate, to 22 mm long; lemma ca. 10 mm long, densely pubescent in lower fourth, above with rows of hairs, in upper part almost glabrous, but with a crown of hairs just below the awn; awn 15-18 cm long, flexuous, twice-geniculate, in lower, twisted part somewhat sharply-scabrous, in upper part short-plumose, with barb of plume ca. 0.3-0.5 mm long.

Central Asia: Pribalkh. (Dzung. coll. A. Shrenk). Endemic. Type in Leningrad.

104 44. *S. consanguinea* Trin. et Rupr. in Mem. Acad. Petersb., ser. 6, VII, 2 (1842) 78; Griseb. in Ldb. Fl. Ross. IV, 449; Kryl. Fl. Zap. Sib. (Fl. west. Sib.) II, 177.

Perennial. Small tufts; culms 17-25 cm tall, glabrous, smooth; leaf sheaths shorter than the internodes, glabrous, the upper ones somewhat dilated, enveloping the inflorescence, purple-tinged; leaves setaceous-folded, glabrous and smooth on the outside, puberulent on the inside (above); ligule 1-1.5 mm long, shorter on the lower leaves than on those of the culm. Inflorescence 6-8 cm long, contracted, loose; glumes subequal, thinly long-acuminate, ca. 2.5 cm long; lemma 8-10 mm long, with a short callus, glabrous below and densely pubescent above, with 5 rows of hairs, more copious below and sparser above, and with a crown of hairs just below the awn; awn 8-10 cm long, once-geniculate, with hairs ca. 0.3 mm long on the twisted lower part, above with hairs to 0.6-0.7 mm long. May-July.

Dry, stony places. - West. Siberia: Alt. Endemic. Described from Chuya Steppe, July 1832, A. Bunge. Type in Leningrad.

45. *S. Spiridonovii* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 302.

Perennial. Forming dense tufts; culm 45-65 cm tall, puberulent, green, with a black ring at the nodes; leaf sheaths glabrous, smooth, or the lower ones puberulent and scaberulous, the uppermost sheath slightly enveloping the inflorescence; leaves setaceous-involute, pubescent on the inside (above), sharply scabrous, short-appressed-hairy on the outside; ligule 1.5-6 mm long, oblong. Inflorescence 20-30 cm long, narrow, loose; glumes narrowly lanceolate, long-acuminate, 2-2.5 cm long; lemma 10-10-11 mm long, with a sharp, naked callus ca. 0.7 mm long, with rows of dense hairs below the awn, with long hairs at the summit; awn 18-20 cm long, twice-geniculate, twisted below, short-ciliate-pubescent all the way up (with hairs ca. 0.5 mm long). June.

Desert steppes. - Centr. Asia: Aral. - Casp. Endemic. Described from Kazakhstan (Mangyshlak, No 755/9, M. D. Spiridonov). Type in Leningrad.

46. *S. Korshkinskyi* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 163; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 177. — *S. consanguinea* Rgl. in A. H. P. VII (1880) 647, ex parte non Trin. et Rupr. — *S. Richteriana* Korsh. Tent. fl. ross. in Mem. Acad. Petersb., ser. 8, VII (1898) 457, non Kar. et Kir.

Perennial. Dense tufts; culms 35–70 cm tall, glabrous; leaf sheaths shorter than internodes, rarely reaching up to inflorescence; leaves thin, setaceous-folded, retrorsely scabrous, the radical ones much longer than those of the culms; ligule very short. Inflorescence 10–20 cm long, narrow, contracted, few-flowered; glumes 12–16 mm long, narrowly lanceolate, long-acuminate, sometimes somewhat tinged, the lower glume slightly longer than the upper; lemma 8–9 mm long, rather densely covered with hairs, with a ciliate crown just below the awn; awn 9–12 cm long, twice-geniculate, twisted below, ciliate-pubescent on the edges all the way up, the hairs being shorter on the lower (twisted) part than on the upper part. June–August.

Dry, sometimes stony, steppes. — European part: Volg. — Kam., Zavolzh., West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral. — Casp., Endemic. Described from the environs of Athasar. Type in Leningrad.

ECONOMIC IMPORTANCE. A needlegrass of secondary importance as fodder; less readily eaten by livestock than the plumose needlegrasses.

47. *S. gigantea* Lag. Gen. et spec. plant. (1916) 3.

Perennial. Dense, compact tufts; culms 50–65 cm tall, glabrous, smooth, robust; leafy up to inflorescence; sheaths longer than the internodes, those of culm leaves glabrous, those of radical leaves more or less minutely-velutinous, ciliate on the margin; leaves narrowly linear, setaceous-involute, glabrous on the outside, puberulent to glabrescent on the inside; ligule oblong, 2–6 mm long. Inflorescence 15–25 cm long, narrow, contracted, fairly dense; glumes subequal, tapering to a long point, 5–6.5 cm long. Lemma 16–17 mm long, with obscure, coalescent rows of hairs, reaching up to the middle of the lemma, glabrous elsewhere, with a long callus; awn 22–25 cm long, obscurely twice-geniculate, twisted, naked and scabrous in lower part, above with hairs shorter than the diameter of the awn. June.

Caucasus: East. Transcauc. (Apsheron Peninsula: semidesert beyond the village Zagul'ba). Gen. Distr.: Medit. Described from Spain. Type in Madrid.

48. *S. holocericea* Trin. in Mem. Acad. Petersb., ser. 6, VII, 2 (1842) 71. — *S. gigantea* Griseb. in Ldb. Fl. Ross. IV 448 (non Lag.) — *S. Fontanesii* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 170 (non Parl?). — Exs.: Edit. Hort. Bot. Petri Magni, No 52 (sub *S. Fontanesii*).

Perennial. Tufted; rhizome short-creeping; culms 45–80 cm tall, robust, glabrous, or pubescent below the nodes, leafy; sheaths of culm leaves about as long as internodes, finely velutinous, ciliate on the margin; leaves narrowly linear, hard involute, more rarely flat; glabrous, smooth or scabrous on the outside, hairy on the inside; ligule on culm leaves to 5 mm long. Inflorescence 15–30 cm long; narrow, contracted, few-flowered; spikelets long-lanceolate, whitish; glumes subequal, tapering to a long point, 2.5–4 cm long; lemma 14–16 mm long, with 5 rows of hairs reaching up to the middle of the lemma and with a crown of hairs just below the awn; awn 18–25 cm long, obscurely twice-geniculate, densely pubescent, in the

twisted lower part, faintly pubescent or sharply scabrous above. June-July. (Plate VII, Figures 25-26).

Mountain slopes and dry stony places. -Caucasus: South, Transcauc., Tal.; Centr. Asia: Upp. Turkmen. Gen. Distr.; Arm.-Kurd., Iran. Described from Talysh. Type in Leningrad.

- 106 49. *S. daghestanica* (Westb.) Grossh. Fl. Kavk. (Fl. Cauc.) I (1928) 65. -*S. Lagascae* var. *daghestanica* Westb. in herb. -*S. Richteriana* auct. fl. Cauc., non Kar. et Kir.

Perennial. Dense tufts; rhizomes short-creeping; culm 50-80 cm tall, glabrous, smooth; leaf sheaths shorter than the internodes, glabrous, smooth; leaves narrowly linear, thin, stiff, glaucous, involute, on upper surface hairy, radical leaves 20-40 cm long, those of the culm shorter; ligule short on lower and up to 10 mm on upper leaves. Inflorescence 12-25 cm long, rather loose, few-flowered; spikelets narrowly lanceolate, whitish. Glumes 30-35 mm long, thin-pointed, subequal; lemma 10-12 mm long, with long, densely pubescent callus, above with rows of hairs reaching up to the middle of lemma, with a crown of hairs just below the awn; awn twice-geniculate, 8-11 cm long, uniformly short-appressed-pubescent all the way up, flexuous above the bend. July-August.

Dry, calcareous and rocky places, 1,000-1,500 m above sea level. -Caucasus: Ciscauc., Dag. Endemic. Described from Dagestan. Type in Leningrad.

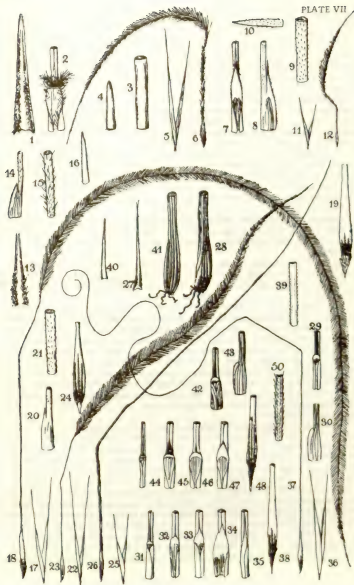
Series 7. *Capillatae* Roshev. -Awn naked all the way up, nearly smooth or more or less scabrous on the edges.

50. *S. Bungeana* Trin. ex Bunge in Mem. Sav. etr. Petersb. II (1835), 144.

Perennial. Tufts small, compact; culm 25-60 cm tall, glabrous, smooth; leaf sheaths shorter than the internodes, glabrous; leaves narrowly lanceolate, setaceous-folded, hard, the radical ones short; ligule on lower leaves short, on upper leaves elongate. Inflorescence 10-15 cm long, narrow, contracted or spreading, loose; spikelets narrowly lanceolate, usually more or less purple-tinged; glumes 9-11 mm long, subequal, lanceolate, long-acuminate. Lemma ca. 5 mm long, with 5 rows of hairs on lower part, and at the summit with short, hard prickles which are transformed into a crown of hairs below the awn; awn 3.5-6.5 cm long, twice-geniculate, twisted below, sharply scabrous all the way up. May-July.

Explanation to Plate VII

- 1-6. *Stipa caucasica* Schmalzh.: 1. (1/1)-leaf tip. -2. (2/1)-ligule of leaf from sterile shoot. -3. (5/1) middle part of leaf blade from sterile shoot. -4. (5/1) its apex. -5-6. (1/1) spikelets and lemma with awn. -7-12. *S. orientalis* Trin.: 7-8. (2/1) ligule of leaf from sterile shoot. -9-10. (5/1) middle part of leaf blade from sterile shoot and its apex. 11-12. (1/1) spikelet and lemma with awn. -13-19. *S. acralinica* P. Smirn.: 13. (1/1) leaf tip. -14. (2/1) ligule of leaf from sterile shoot. -15. (5/1) middle part of leaf blade from sterile shoot. -16. (5/1) its apex. -17-18. (1/1) spikelet and lemma with awn. -19. (5/2)-lemma without awn, from the back. -20-24. *S. trichoides* P. Smirn.: 20. (2/1) ligule of leaf from sterile shoot. -21. (10/1) middle part of leaf awn from sterile shoot. -22-23. (1/1) spikelet and lemma with awn. -24. (3/1) lemma without awn, from the back. -25-26. *S. holosericea* Trin.: spikelet and lemma with awn. (1/1). -27-39. *S. grandis* P. Smirn.: 27. (1/1) leaf tip. -28. (3/2) base of sterile shoot. -29-30. (2/1) ligule of leaf from sterile shoot. -31-35. (3/1) ligule of 1st to 5th culm leaves. -36-37. (1/1) spikelet and lemma with awn. -38. (5/2) lemma from the back. -39. (5/1) middle part of the terminal awn segment. -40-50. *S. baicalensis* Roshev.: 40. (1/1) leaf tip. -41. (3/2) base of sterile shoot. -44-47. (2/1) ligule of 1st to 4th culm leaves. -48. (5/2) lemma without awn, from the back. -50. (5/1) middle part of the terminal awn segment



Dry steppe plots in foothills. - Centr. Asia: Tyan'-Shan. Gen. Distr.: Dzung. - Kashg., Mong., Jap. - Chin. Described from north China. Type in Leningrad.

51. *S. grandis* P. Smirn. in Bull. Soc. Nat. Mosc. XXXVIII (1929) 15.

Perennial. A grayish-green plant, forming small tufts; culms 50-100 cm tall, with 4 nodes, glabrous, scaberulous-puberulent only below the nodes; leaf sheaths longer than the internodes, glabrous, smooth or scaberulous, the uppermost enveloping the inflorescence; leaves setaceous-involute, the radical ones 0.6-0.7 mm in diameter, those of the culm about 1 mm in diameter; glabrous and smooth on the outside, pubescent on the inside; ligules on radical leaves 0.5-1 mm long, on those of the culm to 6 mm, naked. Inflorescence narrow, contracted, 15-25 cm long; glumes subequal, lanceolate, long-acuminate, 3-4.3 cm long, often purple-tinged; lemma 15-16 (17) mm long, uniformly pubescent in lower part, above with 7 rows of hairs which do not reach up to the summit, with a crown of minute hairs below the awn; awn 24-27 cm long, twice-geniculate; twisted in lower part, up to the second bend glabrous and scabrous all the way up. June-July. (Plate VII, Figures 27-39).

Mountain slopes. - East. Siberia: Ang. - Sayan. ?, Daur. ? Far East: Ze. - Bur. Gen. Distr.: Mong. Described from Mongolia. Type in Moscow.

ECONOMIC IMPORTANCE. Eaten in spring by all kinds of livestock; later not eaten.

52. *S. capillata* L. Sp. pl., ed. 2 (1762) 116; Griseb. in Ldb. Fl. Ross. IV, 448; Shmal'g. Fl. II, 595; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 179. - Ic.: Rehb. Ic. Fl. Germ. I, tab. 46, f. 1462. - Exs.: Kneuck. Gram. exs. No 195.

Perennial. Tufts compact; culms 40-80 cm tall, with 4-6 nodes, robust, more or less glabrous; leaf sheaths of the culm much longer than the internodes, more or less smooth, the upper often enveloping the inflorescence; leaves narrowly linear, setaceous-involute, more rarely flat, smooth or scaberulous on the outside, pilose on the inside; ligule on lower leaves 1-2 mm long, on those of the culm 15-20 mm. Inflorescence 10-25 cm long, narrow, contracted, many-flowered; glumes subequal, long-acuminate, 2.5-3.5 cm long, 3-nerved; lemma 10-12 mm long, with a pubescent callosus and 7 rows of hairs, of which the outer two reach nearly to the base of the awn; awn 12-18 cm long, twice-geniculate, capillary, rather sharply-scabrous. June-July.

110 Steppes and stony slopes. - European part: Volg. - Kam., Upp. and Mid. Dnep., Volg. - Don., Zavolz., Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: Ciscauc., Dag., East and South. Transcauc.; West. Siberia: Upp. Tob., Irt., Alt., East. Siberia: Yenisei., Ang. - Sayan., Daur.; Centr. Asia: all regions. Gen. Distr.: Centr. Eur., Medit., Balk. - As. Min., Arm. - Kurd., Iran. Described from Germany. Type in London.

ECONOMIC IMPORTANCE. Stems and foliage are eaten satisfactorily up to heading time, but not later. Hay of fair or even good quality. Serves in spring as superior fattening feed for milch mares. Koumiss [fermented mare's milk] from mares pastured on this needlegrass - as well as on *S. Lessingiana* - is more highly valued than koumiss based on fodder from other plants. Not willingly eaten by sheep and cattle. Average hay yield 900-1,000 kg per hectare. From the beginning to end of fruiting

grazing of sheep on compact stands of needlegrass - and especially on capillary needlegrass - is not recommended, since its sharp, thin fruits cling easily to the fleece, whereupon the twisted awn penetrates like a shaft into the animal's body. In the case of a dense and high stand, the sheep's fleece is not infrequently strewn all over with these fruits; the animal suffers badly, and there are even cases of epizooty (Larin).

53. *S. baicalensis* Roshev. in Bull. Jard. Bot. Princ. URSS XXVIII (1929) 380. - *S. attenuate* P. Smirn. in sched. ex parte.

Perennial. Tufts rather dense; culms 50-70 cm tall, more rarely 15-20 cm (var. *desertorum* Roshev.) or 80-100 cm (f. *robusta* Roshev.), glabrous, smooth; leaf sheaths shorter than the internodes, glabrous, smooth, the uppermost partly enveloping the inflorescence; leaves 15-30 cm long, setaceous-involute, 0.4-0.7 mm in diameter, long-acuminate, on the outside glabrous, smooth, more rarely sharply scabrous (var. *scabrida* Roshev.), on the inside more or less densely-pubescent; ligule to 1.5 mm long. Inflorescence 10-30 cm long, narrow, contracted; glumes narrowly lanceolate, long-acuminate, 2.2-3.2 cm long; lemma (11) 12-14 mm long, more rarely 15-18 mm (var. *macrocarpa* Roshev.), with rows of hairs not reaching up to the summit, and with a long-ciliate crown below the awn; awn 11-20 cm long, more rarely 7-8 cm (var. *desertorum* Roshev.) or 21-28 cm (var. *macrocarpa* Roshev.), twice-geniculate, twisted below, naked or sharply scabrous all the way up. July-August. (Plate VII, Figures 40-50).

Mixed-grass steppes and steppe meadow. - East, Siberia: Len. - Kol. (south), Ang. - Sayan., Daur.; Far East: Ze. - Bur., Ussur, Gen. Distr.: Jap. - Chin. Described from Trans Baikal. Type in Leningrad.

54. *S. densiflora* P. Smirn. in Fedde, Repert. sp. nov. XXVI (1929) 265.

111 Perennial. Tufts small, dense; culms 5-10 (-15) cm tall, glabrous, leafy; leaf sheaths shorter than the internodes, glabrous. Leaves setaceous-involute, short, 0.3-0.4 mm across, grayish-green, on the outside smooth, glabrous or with few short, appressed hairs; inside, on the nerves, minutely densely pubescent; ligule blunt, 0.2-0.3 mm long on sterile shoots and to 3 mm long on culm leaves. Inflorescence short, 3-5 cm long, dense, with a large number of spikelets (25-32), contracted, usually enveloped by the uppermost leaf; glumes subequal, lanceolate, tapering to a short awn, ca. 15 mm long; lemma 6-7 (8) mm long, with rows of hairs not reaching up to the summit, and with a crown of hairs below the awn; awn capillary, 5-7 cm long, twice-geniculate, edged with hairs not exceeding 1 mm in length.

Steppes. - East, Siberia: Ang. - Sayan. Endemic. Described from Minusinsk Raion. Type in Tomsk.

55. *S. margelanica* P. Smirn. in Fedde, Repert. sp. nov. SSVI (1929) 264.

Perennial. Small tufts; culms 30-50 cm tall, glabrous, smooth; leaf sheaths shorter than the internodes, glabrous, smooth; leaves setaceous-involute, more rarely partly flat, on both sides glabrous, smooth; ligule 1-2 mm long, oblong, sometimes slightly dentate. Inflorescence 10-15 cm long, somewhat spreading; glumes subequal, long-acuminate, 1.5-2 cm long; lemma ca. 9 mm long, with a slightly reflexed callus, uniformly pubescent in lower part, above with distinct rows of hairs not reaching up to

the summit, with a crown of few hairs below the awn; awn 9-11 cm long, twice-geniculate, twisted from the lower segment up to the second bend, slopingly arched above, naked and sharply scabrous all the way up. May-July.

Dry, stony slopes. -Centr. Asia: Syr-Dar. Endemic. Described from Margelan Raion between the valley of Isfairam River and Khodzha-aryk. A dry, stony, western slope, at the pass. 31 May 1913, No 892. -N. Desatova. Type in Leningrad.

56. *S. sareptana* Becker in Bull. Soc. Nat. Mosc. LVII (1882) 52. - *S. capillata* var. *sareptana* Schmalh. Fl. II (1897) 595; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 180. - *Stipa praecapillata* Alech. in B. Alekhin and P. Smirnov, *Kratk. predv. otchet o rabote Nizheg. geobotanich. eksped. 1925 g.* (Short Prelim. Account of the Work of Nizheg. Geobot. Exped., 1925) (1926) 171.

Perennial. A grayish-green plant, forming compact tufts; culms 30-70 cm tall, numerous, slender, usually puberulent below the nodes, rarely glabrous (f. *praecapillata* (Alech.) Kryl.); sheaths of lower leaves shorter than the internodes, the uppermost enveloping the inflorescence; glabrous or finely pubescent (var. *kasakorum* Roshev.); leaves setaceous-involute, long, thin, 0.8-1.1 mm in diameter, on the inside glabrous, on the outside sharply scabrous, covered with short bristlelike hairs, more rarely merely scabrous (f. *praecapillata* (Alech.) Kryl.); ligule very short, obsolete, (f. *typica* Roshev.), or to 2 mm long (var. *kasakorum* Roshev.). Inflorescence 10-20 cm long, contracted; glumes subequal, long-acuminate, 1.5-2.5 cm long; lemma 9-11 mm long, pubescent all over below, above with 7 rows of hairs reaching up to 3/4 of the body, 112 with a crown below the awn consisting of 2-3 hairs or crownless (f. *typica* Roshev.), or with a well developed crown consisting of numerous hairs (var. *kasakorum* Roshev.). Awn 10-16 cm long (f. *typica* Roshev.) or 15-21 cm (var. *kasakorum* Roshev.), capillary, scabrous, twice-geniculate. May-June.

Steppes. -European part: Zavolzh., Prichern. (East. part); Low. Don., Low. Volg.; Caucasus: Ciscauc.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral.-Casp., Pribalkh., Dzung.-Tarb., Kyz.-Kum., Upp. Turkm., Syr-Dar., Tyan'-Shan (north). Endemic. Described from environs of Krasnoarmeisk (Sarepta). Type in Leningrad.

ECONOMIC IMPORTANCE. Approaching *S. capillata* L. as regards fodder value, but hay yield does not exceed 400 Kg per hectare on account of thin stands.

57. *S. Krylovii* Roshev. in Bull. Jard. Bot. Princ. URSS XXVIII (1929) 379.

Perennial. Forms rather dense tufts. Culms 30-50 cm tall, more rarely 8-12 cm (var. *desertorum* Roshev.) or 60-80 cm (var. *elongata* Roshev.), glabrous, smooth; leaf sheaths shorter than the internodes, glabrous, smooth, the uppermost leaf partly enveloping the lower part of inflorescence; leaves setaceous-involute, 0.3-0.5 mm in diameter, acuminate, rarely reaching up to one-half the height of culm, glabrous, smooth on the outside or more or less scabrous (var. *scabrida* Roshev.), glabrous or puberulent (not pilose) on the inside; ligule up to 1 mm long. Inflorescence 10-20 cm long, narrow, contracted; glumes subequal, narrowly lanceolate, long-acuminate, 1.8-2.5 cm long; lemma (8-) 10-13 mm long, with rows

of hairs not reaching up to the summit, with a ciliate crown below the awn; awn capillary, (8-) 10-17 (-20) cm long, twice-geniculate, glabrescent or scaberulous, twisted below. July-August.

Steppes and steppe meadows. - West, Siberia: all regions; East, Siberia: Len.-Kol., Ang.-Sayan, Daur. Gen. Distr.: Mong. Described from Altai. Type in Leningrad.

Genus 102. ORYZOPSIS* MICHX.

Michx, Fl. bor. amer. 1 (1803) 51.

Inflorescence paniculate, contracted or spreading, loose. Spikelets 1-flowered, ovoid or lanceolate. Glumes 2, membranaceous, about equal. Lemmas shorter than spikelets, indurate in fruit, dorsally flattened, firmly enveloping the caryopsis. Lemma more or less lanceolate, glabrous or covered with slender hairs, awned at the summit; palea narrower, with 2 keels. Awn straight, not twisted, slender, very brittle. Lodicules 2. Stamens 3. Pistils short, with plumose stigmas. Caryopsis oblong, dorsally flattened. Perennials.

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1. Ligule very short or wanting 1. *O. virescens* (Trin.) Beck.
+ Ligule always several mm long. 2.
2. Lemma entirely glabrous. . 2. *O. coerulescens* (Desf.) Hack.
+ Lemma more or less pubescent 3.
3. Glumes punctate-scabrous at the summit 6. *O. ferganensis* Litw.
+ Glumes glabrous at the summit. 4.
4. Lemma pubescent only at the summit, middle and lower parts glabrous;
occurring only in Kazakhstan A. *O. songorica* (Trin. et Rupr.) B. Fedtsch.
+ Lemma pubescent all over in young state, later glabrous on the back,
but pubescent at the summit and at the base. 5.
5. A very large plant, 80-110 cm tall; leaves always flat, 6-12 mm broad
. 7. *O. latifolia* Roshev.
+ Plants rarely attaining 80 cm in height; leaves up to 4 mm broad. . 6.
6. Spikelets very large, 10-12 mm long; culms 45-55 cm tall; occurring
only in Kopet Dag. 8. *O. kopetdagensis* Roshev.
+ Spikelets rarely exceeding 7 mm in length. 7.
7. Inflorescence always contracted, spike-like 9. *O. molinioides* (Boiss.) Hack.
+ Inflorescence more or less open. 8.
8. Inflorescence short, with spreading branches bearing 1-2 spikelets;
lemma ca. 4 mm long 10. *O. purpurascens* Hack.
+ Inflorescence more or less open, with branches bearing numerous
spikelets; lemma 5-6 mm long. 9.
9. Plants rarely attaining 50 cm in length; all radical leaves setaceous-
involute; lemma always glabrous on the back, pubescent at the summit
and at the base. 5. *O. kokanica* (Rgl.) Roshev.
+ Plant 50-80 cm tall, robust; leaves flat or only partly involute. Lemma
pubescent all over or glabrous on the back.
. 3. *O. holciformis* (MB) Hack.

* From Greek *oryza* - rice, and *opsis* - appearance.

1. *O. virescens* (Trin.) Beck. Fl. Nied. Oesterr. (1890) 51. - *Urachne virescens* Trin. Fund. Agrost. (1820) 110. - *Piptatherum virescens* Boiss. Fl. Or. V (1884) 507; Shmal'g. Fl. II, 597. - *Milium paradoxum* M. B. Fl. taur.-cauc. I (1808) 53; Griseb. in Ldb. Fl. Ross. IV, 445 non L. - Ic.: Rehb. Ic. Fl. Germ. I (1834) tab. 45, fig. 1460. - Exs.: Herb. Fl. cauc. No 53.

Perennial. Tufts dense; roots fibrous; culms 50-100 cm tall, slender, glabrous, smooth, scaberulous in upper part; leaves linear-lanceolate, those of the culm to 7 mm broad, sometimes partly involute, rather smooth; 114 ligule very short. Panicle open, with scaberulous axis and long, slender branches, loose; spikelets 4-5 mm long, lanceolate, whitish-green; glumes hyaline, with 3-5 green nerves, the upper glume oblong-lanceolate, with 5 nerves and awn about 15 mm long. May-July. (Plate V, Figure 10).

Stony sites. - European part: Low. Don (Elista), Crimea; Caucasus: Cis-cauc., Dag., West. and East. Transcauc. Gen. Distr.: North, part of Medit., Balk. - As. Min., Arm. - Kurd. Described from the Caucasus. Type in Leningrad.

2. *O. coerulescens* (Desf.) Hack. in Denkschr. Acad. Wien, I (1885) 75. - *Milium coerulescens* Desf. Fl. Atl. (1800) 66, tab. 12. - *Piptatherum coerulescens* P. B. Agrost. (1812) 18 et 173. - *Agrostis coerulescens* CD. Fl. Fr. V (1815) 250. - *Urachne coerulescens* Trin. Fund. Agrost. (1820) 110. - Ic.: Desf. l. c. - Exs.: Kneuck. Gram. exs. No 88.

Perennial. Tufts small; rhizomes short-creeping; culms 45-70 cm tall, erect, glabrous; leaf sheaths shorter than the internodes, glabrous; leaves narrowly linear, the radical ones often setaceous-involute, the veins scabrous on the upper surface; ligule pointed or split, to 7 mm long. Inflorescence paniculate, spreading, loose, 10-20 cm long, more or less nodding in fruit, with long branches; spikelets ovoid-acuminate, more or less greenish; glumes subequal, membranaceous, ca. 6 mm long, ovate-acuminate; lemma 3 mm long, indurate-coriaceous on the fruit, tawny, naked, lustrous, tightly enveloping the palea, terminating in an awn; awn about as long as the lemma, straight, slender, deciduous. May-June. (Plate V, Figure 11).

Grows on stony slopes, ascending in the mountains up to 2,000 m. - Centr. Asia: Upp. Turkm., Syr-Dar., Pam. - Al. Gen. Distr.: Medit., Balk. - As. Min., Iran. Described from the Atlas (North Africa). Type in Florence.

3. *O. holciformis* (M.B.) Hack. in Denkschr. Acad. Wien, I (1885) 75. - *Agrostis holciformis* M.B. Fl. taur.-cauc. I (1808) 54. - *Piptatherum holciforme* Roem. et Schult. Syst. veg. II (1817) 328. - *Urachne grandiflora* Trin. Gram. unifl. (1824) 174. - *Milium holciforme* Spreng. Syst. veg. I (1825) 251; Griseb. in Ldb. Fl. Ross. IV, 446. - *M. coerulescens* β *holciforme* Rgl. in A. H. P. VII (1880) 644. - *M. holciforme* var. *sphacelatum* Rgl. in Bull. Soc. Nat. Mosc. XLI, 2 (1868) 303.

Perennial. Tufts small, compact; rhizomes short-creeping; culms 50-80 cm tall, erect, glabrous; leaf sheaths shorter than the internodes, glabrous; leaves narrowly linear, to 4 mm broad, scabrous on the veins on the upper surface, flat, or the lower leaves setaceous-involute (var. 115 *angustifolia* Rgl.); ligule oblong-acuminate, 3-5 mm long. Inflorescent paniculate, open, loose, the branches in twos, to 18 cm long, scabrous, loose; spikelets ovate-acuminate, greenish or with a purple spot at the base; glumes subequal, membranaceous, 7-9 mm long, 5-7-nerved, hyaline on

the margin. Lemma 5-6 mm long, indurate-coriaceous in fruit, dark brown all over, more or less appressed-hairy, or glabrous on the back, tightly enveloping the lemma, terminating in an awn; awn 1.5-3 times longer than body of lemma, straight, slender, thin, deciduous. May-July. (Plate V, Figure 12).

On stony mountain slopes. -European part: Prichern., (?), Crimea.; Caucasus: Ciscauc., Dag., East, and South. Transcauc., Centr. Asia: Upp. Turkm., Syr-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: Balk. -As. Min., Arm.-Kurd., Iran, Dzung. -Kashg. Described from Crimea. Type in Leningrad.

ECONOMIC IMPORTANCE. The grain of ricegrass provides good feed for domestic fowl. According to G. K. Balabaev, in Uzbekistan, in localities where poultry keeping is developed, sites occupied by ricegrass serve as excellent natural pasture for poultry.

4. *O. songorica* (Trin. et Rupr.) B. Fedtsch. Rast. Turk. (Plants of Turkestan) (1915) 94. -*Urachne songorica* Trin. et Rupr. in Mem. Acad. Petersb., ser. 6, VII 2 (1842) 15. -*Milium holciforme* β *songoricum* Griseb. in Ldb. Fl. Ross. IV (1853) 446. -*M. coerulescens* γ *songoricum* Rgl. in A. H. P. VII I (1880) 664. -*Oryzopsis holciformis* var. *songorica* Hack. ex Paulsen in Kjoeb. Vidensk. Meddel. (1903) 164; Kryl. Fl. Zap. Sib. [Fl. West. Sib.] II, 182.

Perennial. Tufts small; rhizomes short-creeping; culms 40-60 cm tall, glabrous, smooth; leaf sheaths shorter than the internodes, glabrous; leaves narrowly lanceolate, to 4 mm broad, linear-acuminate, flat or partly folded, scabrous on the margins; ligule to 8 mm long, pointed. Panicle loose, spreading or contracted, few-flowered, to 20 cm long, with branches usually not exceeding 8-10 cm in length, borne on the axis of the inflorescence singly or in twos. Spikelets broadly lanceolate, greenish, more rarely purplish. Glumes 6-7 mm long, hyaline, the lower glume 7-nerved. Lemma 3-4 mm long, indurate-coriaceous in fruit, dark brown or almost black, lustrous, broadly ovate, pointed, pubescent only on upper third, terminating in an awn; awn $1\frac{1}{2}$ -3 times as long as the lemma, straight, slender, scabrous, deciduous. May-July. (Plate V, Figure 13).

Dry slopes. -West. Siberia: Irt., Centr. Asia: Aral. -Casp., Pribalkh., Dzung. -Tarb., Kyz. -Kum., Tyan'-Shan. Gen. Distr.: Dzung. -Kashg. Described from Tarbagatai. Type in Leningrad.

5. *O. kokanica* (Rgl.) Roshev. sp. nov. in Addenda p. 742. -*Milium coerulescens* ϵ *kokanicum* Rgl. in A. H. P. VII (1880) 644. -*Oryzopsis holciformis* var. *kokanica* Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 180.

Perennial. Tufts small, compact; rhizome short-creeping; culms 25-50 cm tall, slender, glabrous, smooth, with numerous remains of old leaf sheaths at the base, almost leafless above; leaves narrowly linear, the radical ones setaceous-folded, those of the culm more or less flat, short; leaf sheaths shorter than the internodes; ligule elongate, to 5 mm long. Panicle loose, more or less spreading, with smooth branches to 8-10 cm long, arranged in twos or threes; spikelets lance-acuminate, green, usually purple at the base and sometimes at the summit, 6-8 mm long; glumes subequal, 5-7-nerved; lemma ca. 5 mm long, lanceolate, blackish-brown in fruit, indurate, pubescent all over, becoming glabrous on the back, awned from the summit; awn approximately twice as long as the body, straight, scabrous, brittle. May-July. (Plate V, Figure 14).

Exposed slopes. -Central Asia: Pam. -Al., Tyan'-Shan. Endemic. Described from Zeravshan (Varzaminor, VI 1870, O. Fedchenko). Type in Leningrad.

6. *O. ferganensis* Litw. sp. nov. in Addenda p. 742.

Perennial. Tufts loose; rhizomes fibrous; culms about 50 cm tall, erect, glabrous, with a bunch of radical leaves at the base and leafy up to inflorescence; sheaths shorter than or nearly as long as the blades; leaves flat, to 10 mm broad, gradually tapering to a point, sharply scabrous; ligule 5-6 mm long, blunt. Panicle often subtended by the uppermost leaf, many-flowered, contracted, to 12 cm long, with sharply scabrous branches arranged in twos or threes; spikelets ca. 7 mm long; glumes subequal, lanceolate, acuminate, purplish or whitish and punctate-scabrous-pubescent at the summit; the lower glume 7-nerved, the upper one 5-nerved; lemma lanceolate, 5 mm long, ovate, indurate in grain, appressed-pilose all over the back or on the upper half, awned from the summit; awn straight or slightly bent, ca. 8 mm long, deciduous. May. (Plate V, Figure 15, a).

Mountain slopes. -Central Asia: Tyan'-Shan. Endemic. Described from Arslanbob, Andizhanskii Raion. Type in Leningrad.

7. *O. Latifolia* Roshev. sp. nova in Addenda p. 742.

Perennial. Occasionally forming small tufts; rhizome short-creeping; culms 80-110 cm tall, robust, thick, glabrous; smooth; leaf sheaths shorter than the internodes, glabrous, smooth; leaves broadly linear, 6-12 mm broad, long-acuminate, always flat, smooth underneath, scabrous above on the veins, the radical leaves shorter than those of the culm; ligule elongate, to 5 mm long. Panicle 12-20 cm long, rather contracted, many-flowered, with scabrous branches arranged singly or in pairs and attaining 8 cm in length; spikelets always green, broadly lance-acuminate, ca. 8 mm long; glumes subequal, membranaceous or ovate-acuminate, indurate-coriaceous in fruit, blackish-brown, pubescent all over, becoming naked on the back, awned from the summit; awn 3-4 times longer than the lemma slender, flexuous, scabrous, deciduous. May-July. (Plate V, Figure 16, a).

117 Mountain slopes. -Central Asia: Pam. -Al. Endemic. Described from Khodzhen Raion. -Ingrychak (8 May 1914, O. Knorring). Type in Leningrad.

8. *O. kopetdagensis* Roshev. sp. nov. in Addenda p. 743. -Exs.: Ed. Horti Bot. Petri Magni No 53 (sub *O. holciformis* var. *kokanica* Roshev.).

Perennial. Dense tufted; rhizome short-creeping; culms 45-46 cm tall, ascending at the base, glabrous, smooth; leaf sheaths shorter than the internodes, glabrous, smooth; leaves linear, long-acuminate, to 3 mm broad, grayish-green, scaberrulous underneath, strongly scabrous on the upper surface, numerous at the base of culm; ligule 5-6 mm long, elongate or truncate. Panicle 10-15 cm long, pyramidal or oblong, with scabrous branches to 8 cm long, arranged in pairs on the inflorescence axis; spikelets large, 10-12 mm long, lance-acuminate; glumes green at the base, purplish at the middle and yellowish above, equal, hyaline, 5-7 nerved; lemma ca. 6 mm long, indurate in fruit, brown, pubescent all over, becoming naked on the back, awned from the summit; awn short, 1.5 times as long as the lemma, straight, sharply scabrous, brittle. April. (Plate V, Figure 17).

Mountain slopes. -Centr. Asia: Upp. Turkm. (Kopet Dag). Endemic. Described from Kopet Dag. Type in Leningrad.

9. *O. molinioides* (Boiss.) Hack. ex Paulsen in Kjoeb. Videnak. Meddel. (1903) 165. -*Piptatherum molinioides* Boiss. Diagn., ser. 1, VII (1846) 121. -*Piptatherum laterale* Munro (1886) ex Hack., l.c. -*Milium laterale* Rgl. in A.H.P., VII (1880) 645. -*Oryzopsis lateralis* Stapf. in Hook. Fl. of Br. Ind. VII (1897) 234.

Perennial. Tufts small; culms 15-50 cm tall, usually with 2 nodes, erect, glabrous; leaf sheaths shorter than the internodes; leaves narrow, linear, to 2 mm broad, glabrescent underneath, scabrous above on the veins; ligule 2-4 mm long, more or less split. Inflorescence 5-20 cm long, very narrow, contracted, nearly always short-branched; spikelets lance-ovate, green, nearly always with a dark red summit; glumes thin-coriaceous, 6-7 mm long, subequal, 5-nerved; lemma 4.5-6 mm long, narrowly lanceolate, indurate-coriaceous in fruit, dark brown, puberulent all over or partially glabrous, awned from the summit; awn about as long as the body, slender, thin, straight, scabrous, deciduous. May-July. (Plate V, Figure 18).

Stony mountain slopes. -Caucasus: South. Transcauc. (Nakhichevan Republic, Ordubad Raion. -I. Koryagin and I. Isaev); Centr. Asia: Pam. -Al., Tyan'-Shan. Gen. Distr.: Iran, Ind. -Him., Dzung. -Kashg. Described from Persia. Type in Geneva.

10. *O. purpurascens* Hack. ex Paulsen in Kjoeb. Videnak. Meddel. (1903) 164.

- 118 Perennial. Tufted; culms 30-40 cm tall, with 2-3 nodes, erect, glabrous, almost leafless above; leaf sheaths much shorter than internodes, scabrous or almost smooth; leaves linear, to 2 mm broad, often setaceous-folded, acuminate, 5-10 cm long, glaucous, scaberulous on the lower surface pubescent on the upper surface, sharply scabrous on the margin; ligule to 6 mm long, obtuse. Panicle usually 18-26 cm long, oblong-ovoid, spreading, interrupted, few-flowered, with scabrous, single or paired branches, 5-8 cm long, bearing 1-2 spikelets each; spikelets broadly lanceolate, ca. 8 mm long, green, dark red at the summit; glumes subequal, broadly lanceolate, 7-nerved. Lemma ca. 4 mm long, oblong, obtuse, indurate in fruit, dark brown, short-pubescent, awned at the summit; awn about as long as the body, straight, only just exerted, thin, scabrous, brittle. (Plate V, Figure 19).

Stony slopes in high-mountain areas. -Centr. Asia: Pam. -Al. Endemic. Described from Pamir. Type in Vienna, cotype in Leningrad.

Genus 103. TIMOURIA* ROSHEV.

Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 173.

Inflorescence narrow, dense, short-branched, spikelike. Spikelets 1-flowered, perfect, short-pedicel. Glumes coriaceous, subequal, 3-nerved, acuminate, sharply scaberulous. Lemma shorter than the glumes, 3-nerved, pubescent, with awn arising from between 2 teeth. Awn straight,

* Named after Timur, or Tamerlane, famous Asian conqueror.

slender, deciduous. Palea somewhat shorter than the lemma, with 2 keels, pubescent. Lodicules 3. Stamens 3, with anthers naked at the end.

1. T. Saposhnikowii Roshev. in Fl. Az. Ross. (Fl. As. Russ.) XII (1916) 174, tab. XII.

Perennial. Small tufts; rhizome short, creeping; culms 35-50 cm tall, more or less erect, glabrous; leaf sheaths shorter than the internodes; leaves narrow, setaceous-folded, glabrous underneath, scabrous on the upper surface, the radical ones longer than those of the culm; ligule on radical leaves short, on culm leaves to 1.5 mm long. Inflorescence 5-9 cm long, dense, many-flowered, narrow, contracted, forming a more or less spike-like panicle; spikelets ca. 5 mm long, narrowly lanceolate, short-pedicelled, greenish; glumes lance-acuminate, the upper somewhat shorter than the lower; lemma ca. 3 mm long, elliptic, rather densely pubescent on the back, with a straight, untwisted, sharply scabrous awn about as long as the body. July-August. (Plate V, Figure 20, a, b).

Stony slopes and pebbles. - Centr. Asia: Tyan'-Shan. Endemic. Described from the Sary-dzhas River, at the Kainda Estuary. Type in Leningrad.

Genus 104. MILIUM* L.

L. Gen. pl. (1737) 17.

Inflorescence paniculate. Spikelets 1-flowered, perfect, ovoid, glabrous. Glumes membranaceous, subequal, always awnless, cartilaginous at maturity, lustrous, obscurely 3-nerved. Lodicules 2, small; stamens 3, with naked anthers. Pistil with short styles and plumose stigmas. Caryopsis elliptic or oblong, falling together with the lemmas at maturity. Annual or perennial plants.

1. Annual plant, 20-70 cm tall; leaf sheaths scabrous. Panicle to 10 cm long 1. *M. vernale* M.B.
- + Perennial plant, 60-150 cm tall 2.
2. Panicle very loose, broadly pyramidal, with horizontal or even reclinate branches. Spikelets ca. 3 mm long 2. *M. effusum* L.
- + Panicle contracted, dense, with upright, more rarely horizontal, short branches. Spikelets ca. 4 mm long 3. *M. Schmidtianum* C. Koch.

1. *M. vernale* M.B. Fl. taur. -cauc. I (1808) 53; Griseb. in Ldb. Fl. Ross. IV, 445; Boiss. Fl. Or. V, 510; Shmal'g. Fl. II, 598. - *Agrostis vernalis* Poir. Encycl. Suppl. I (1810) 259. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 45, f. 1458. - Exs.: HFR, No 1500; Fl. Caus., Exs. No 53.

Annual. Roots fibrous; culms 20-70 cm, erect, often profusely branching at the base, slender; leaf sheaths shorter than the internodes, glabrous, more or less scaberulous; leaves linear, to 4 mm broad, glabrous; ligule pointed, to 7 mm long. Inflorescence paniculate, 5-10 cm long, loose, with branches set obliquely upward; spikelets ovoid, 2.5-3 mm long, more or less whitish; glumes equal, hyaline, 3-nerved, papillose-scaberulous;

* *Milium* - name used by Pliny for millet.

lemmas somewhat shorter than the glumes, ovate-acuminate, cartilaginous in fruit, whitish, smooth, obtuse. April-May. (Plate V, Figure 21).

Mountain meadows, coppices, and forest borders. -European part: Mid. Dnep., Prichern., Crimea; Caucasus: Ciscauc., Dag., West. and East. Transcauc.; Centr. Asia: Dzung. -Tarb., Upp. Turkm., Syr-Dar., Pam. -Al., Tyan'-Shan. Gen. Distr.: Centr. and Atl. Eur. Medit., Balk. -As. Min., Iran. Described from Crimea. Type in Leningrad.

2. *M. effusum* L. Sp. pl. (1753) 61; Griseb. in Ldb. Fl. Ross. IV, 444; Shmal'g. Fl. II, 59; Kryl. Fl. Zap. Sib. [Fl. West. Sib.] II, 183. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 45, f. 1456. -Exs.: HFR, No 544.

Perennial. Rhizome spreading, with short underground shoots to 10 cm long; culms 60-100, more rarely 100-150 cm tall (var. *elatus* C. Koch), erect, glabrous, smooth; leaf sheaths shorter than the internodes, glabrous, smooth; leaves broadly linear, to 1.8 cm broad, smooth or more or less scabrous; ligule elongate-oblong, to 8 mm long, with an obtuse or lacerate tip. Inflorescence a branched panicle, 15-35 cm long, diffuse, with long, subhorizontal branches; spikelets ovate, whitish or green, more rarely purple-tinged (var. *coloratum* Roshev.); glumes ca. 3 mm long, 3-nerved, scaberulous; lemmas coriaceous, cartilaginous in fruit, awnless. June-August. (Plate V, Figure 22, a).

Coniferous and deciduous forests. -European part: all regions; Caucasus: Ciscauc., Dag., West. and East. Transcauc.; West. Siberia: all regions; East. Siberia: Ang. -Sayan., Daur.; Far East: all regions, except Okhotsk; Centr. Asia: Dzung. -Tarb., Tyan'-Shan. Gen. Distr.: all Europe, except southern part of Mediterranean, Dzung. -Kashg., Jap. -Chin., N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Readily eaten by livestock, but of limited importance as fodder, as it occurs in small quantities. Seeds provide good feed for birds, and they can yield flour suitable for baking of bread. Straw furnishes good material for hat weaving.

3. *M. Schmidtianum* C. Koch. in Linnaea XXI (1948) 438. -M. *effusum* β *Schmidtianum* Griseb. in Ldb. Fl. Ross. IV (1853) 445. -M. *caucasicum* Somm. et Lev. in Nuov. Giorn. Bot. Ital. (1897) 209 et in A. H. P. XVI (1900) 440, tab. XLIV. -Ic.: Somm. et Lev., l.c.

Perennial. Rhizome short-creeping, fairly thick; culms 120-150 cm tall, erect, glabrous; leaves broadly linear, to 2 cm broad, glabrous, sharply scaberulous on the upper surface, sometimes almost glabrous underneath; ligule oblong, lacerate, ca. 5 mm long. Panicle contracted, dense, ovoid, with upright, rarely horizontally reflexed, short branches, arranged in semi-vercils of 4 to 6; spikelets ca. 4 mm long, darkish green, more rarely purplish; glumes distinctly 3-nerved, scabrous; lemma and palea coriaceous, cartilaginous in fruit, awnless. June-September. (Plate V, Figure 23).

Subalpine meadows. -Caucasus: Ciscauc. and West. Transcauc. Described from Georgia. Type in Leningrad.

Inflorescence a contracted or open, many-flowered panicle. Spikelets small, 1-flowered, perfect. Glumes 2, membranaceous, mostly equal, rarely with a short awn. Lemma indurate, longer than or as long as the glumes, narrow, 3-nerved, deciduous, terminating in a point or in two teeth, awned. Awn straight or twisted, delicate, slender. Palea hyaline, as long as the lemma, with 2 keels. Lodicules 2, small. Stamens 2. Pistil with plumose stigmas. Caryopsis free, narrow-oblong.

- 121 1. Awn 5-6 times as long as the body of the lemma 1. *M. Hugelii* Trin.
+ Awn 2-3 times as long as the body of the lemma 2. *M. japonica* Steud.

1. *M. Hugelii* Trin. in Mem. Acad. Sc. Petersb., ser. 6, VI 2 (1845) 293. - *M. viridissima* Nees in Steud. Syn. Gram. (1855) 178.

Perennial. A plant with long underground shoots covered with scaly leaves; culm 50-100 cm tall, erect or ascending, with numerous nodes, branching, copiously leafy, glabrous, puberulent and tinged below the nodes; leaves narrow, long-lanceolate, to 1 cm broad, scaberulous underneath, strongly scabrous on the upper surface; ligule short, obtuse. Panicle 20-30 cm long, narrow, nodding, many-flowered; spikelets 3-3.5 mm long, whitish-green; glumes hyaline, ca. 1.5 mm long, lanceolate, sharply scabrous, the lower somewhat shorter than the upper; lemma 3-3.5 mm long, lanceolate, with fairly long hairs below, scabrous above, with awn arising slightly below the bifid summit; awn 5-6 times as long as the body of the lemma, straight, not twisted, sharply scabrous, capillary toward the end. July-September. (Plate V, Figure 24).

In forests in the shade of trees, also on mountain slopes (Tadzhikistan). - Far East: Ussur.; Centr. Asia: Pam. - Al. Gen. Distr.: Ind. - Him., Jap. - Chin. Described from Himalayas. Type in Leningrad.

2. *M. japonica* Steud. Syn. Gram. (1855) 422.

Perennial. A plant with short underground shoots; rhizome short-creeping; culms 50-100 cm tall, ascending, often rooting at the nodes, branching or unbranched, glabrous, smooth, sometimes purple at the nodes; leaves narrowly linear, acuminate, to 4 mm broad, 5-10 cm long, scabrous on both sides; ligule very short, obtuse. Panicle 8-18 cm long, narrow, contracted, interrupted, sometimes nodding; spikelets numerous, ca. 3 mm long, greenish or purplish; glumes hyaline, 1.5-2 mm long, broadly lanceolate, the lower somewhat shorter than the upper, scabrous; lemma ca. 3 mm long, lanceolate, with fairly long hairs below, scabrous above, with awn arising slightly below the bifid summit; awn 2-3 times longer than the body of the lemma, straight, not twisted, sharply scabrous. August-September. (Plate V, Figure 25).

Old fields and edges of forests. - Far East: Ussur. Gen. Distr.: Jap. - Chin. Described from Japan. Type in Geneva.

* Named after Heinrich Ludwik [sic; should be Gotthilf Heinrich Ernst] Muehlenberg, investigator of the flora of North America (1756-1817) [sic; should be 1753-1815].

Genus 106. CRYPSIS* AIT.

Ait. Hort. Kew., ed. I. I (1789) 48.

Inflorescence capitate or spike-like, usually surrounded by sheaths of 122 upper leaves. Spikelets 1-flowered, laterally compressed, sessile or short-pedicelled. Glumes lanceolate, keeled, acute. Lemmas longer than the glumes, awnless, membranaceous. Lodicules lacking. Stamens 2-3. Stigmas filiform, minutely plumose. Pericarp not united with the seed coat, utricular, (Schlauchfrucht).

1. Inflorescence axis obsolete, inflorescence very short, spikelets gathered in a more or less flat head 1. *C. aculeata* (L.) Ait.
- + Inflorescence axis distinct, inflorescence round, oblong, or cylindrical 2.
2. Inflorescence small, round, not very dense 2. *C. turkestanica* A. Eig.
- + Inflorescence dense, compact, oblong or cylindrical 3.
3. Sheath of the uppermost leaf shorter than the blade, strongly dilated, seemingly subtending the inflorescence; the latter more or less ovoid or oblong 3. *C. schoenoides* (L.) Lam.
- + Sheath of the uppermost leaf longer than the blade not dilated or slightly dilated, placed at some distance from the base of inflorescence, rarely enveloping its lower part 4.
4. Leaf sheaths glabrous. Glumes and lemma keeled, pointed 4. *C. alopecuroides* (Pill. et Mitt.)
- + Leaf sheaths pubescent. Glumes and lemma with a keel extending into a rather stout awn 5. *C. Borszczowi* Rgl.

1. *C. aculeata* (L.) Ait. Hort. Kew. I (1789) 48. -Griseb. in Ldb. Fl. Ross. IV, 460; Shmal'g. Fl. II, 598; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 184. -*Schoenus aculeatus* L. Sp. pl. (1753) 42. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 48, fig. 1469. -Exs.: Kneucker, Gram. exs. No 89.

Annual. Tufted; culms 5-40 cm tall, more rarely 2-4 (f. minima Beck.), more or less prostrate, smooth; sheaths of upper leaves shortened, dilate, strongly bent sideways, enveloping the inflorescence; leaves long-acuminate, stiff, more or less involute; ligule ciliate. Inflorescence hemispherical, capitate, many-flowered, to 1.5 cm broad, surrounded by sheaths of the uppermost leaves; spikelets lanceolate, whitish; glumes narrow, 3-4 mm long, ciliate-serrate on the keel; lemma and palea longer than the glumes, palea with one keel. Stamens 2. June-August. (Plate VIII, Figure 1, a, b).

- 125 Wet sandy, clayey, and saline soils. -European part: Mid. Dnep., Volg. -Don., Zavolzh., Prichern., Crimea, Low. Don., Low. Volg.: Caucasus: Ciscauc., West., and South. Transcauc., Tal.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral.-Casp., Pribalkh., Dzung. -Tarb., Kyz.-Kum., Kara-Kum., Syr-Dar. Gen. Distr.: Medit., Dzung. -Kashg., Mong., China. Described from Southern Europe. Type in London.

ECONOMIC IMPORTANCE. Eaten satisfactorily by livestock.

2. *C. turkestanica* A. Eig. in Nat. Hist. Agric. Rec. No 2 (1929) 206.

Annual. Tufted; culms 5-15 cm tall, prostrate, glabrous; sheaths of

* From Greek *krupsis* - concealed, alluding to inflorescence concealed by leaves in the case of *C. aculeata*.



the uppermost leaves reduced in length, dilated, strongly bent sideways, enveloping the inflorescence; leaves long-acuminate, more or less involute; ligule ciliate. Inflorescence capitate, contracted, 1.5-2 times longer than broad, with a short axis to which spikelets are attached by short pedicels; spikelets lanceolate, whitish; glumes narrow, 3-4 mm long, ciliate-serrate on the keel; lemma and palea longer than the glumes, obtuse; palea with 2 keels. Stamens 2-3. April-July. (Plate VIII 2, a, b).

Saline sands and clays. -European part: Low. Volg.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral, -Casp., Pribalkh., Dzung. -Tarb., Kyz. -Kum, Kara-Kum., Endemic. Described from Central Asia.

3. *C. schoenoides* (L.) Lam. III. I (1791) 166; Griseb. in Ldb. Fl. Ross. IV, 459. -*Phleum schoenoides* L. Sp. pl. (1753) 60. -*Heleochoa schoenoides* Host, Gram. austr. I (1801) 23; Shmal'g. Fl. II, 598; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 186. -*lc.*: Lam., l. c., tab. 42, fig. 1.; Host, l. c., tab. 30; Rchb. Ic. Pl. Germ. I, tab. 48, fig. 1471. -*Exs.*: HFR No 244, sub *Heleochoa*.

Annual. Tufted; culms 5-40 cm tall, more rarely 2-3 cm (var. *minima* Roshev.), more or less prostrate, glabrous; the uppermost leaf sheath or both upper leaf sheaths dilated, subtending the inflorescence or somewhat enveloping it; leaves narrow, acuminate, more or less involute; ligule ciliate. Inflorescence whitish or grayish-purple, more or less oblong, 0.5-3 cm long and to 2 cm broad, spike-like; spikelets lanceolate, ca. 3 mm long; glumes membranaceous, with a somewhat indurate, ciliate keel; lemma lanceolate, with a more indurate keel; palea with 2 keels. Stamens 3. July-September. (Plate VIII, Figure 3 a).

Wet sandy and solonchaks sites. -European part: Mid. Dnep., Volg. -Don., Zavolzh., Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: Ciscauc., Dag., East. and South. Transcauc.; West. Siberia: Irt.; Centr. Asia: Aral. -Casp., Pribalkh., Kara-Kum., Upp. Turkm., Amu-Dar. Gen. Distr.; Medit., Balk. -As. Min., Arm. -Kurd., Iran, Dzung. -Kashg. Described from Southern Europe. Type in London.

4. *C. alopecuroides* (Pill. et Mitt.) Schrad. Fl. Germ. I (1806) 167; Griseb. in Ldb. Fl. Ross. IV, 459. -*Phleum alopecuroides* Pill. et Mitt. It. (1783) 147. -*Heleochoa alopecuroides* Host, Gram. austr. I (1801) 77; Shmal'g. Fl. II, 598; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 185. -*H. explicata* Hack. ex Grossh. Fl. Cauc. I (1928) 70. -*Phalaris explicata* Link in Schrad. Journ. (1799) 312. -*lc.*: Rchb. Ic. Pl. Germ. I, tab. 48, fig. 1471. -*Exs.*: HFR No 44.

Annual. A grayish-green plant; culms 6-30 cm tall, prostrate, ascending, glabrous; leaf sheaths glabrous, not reaching up to inflorescence or, more rarely, enveloping only its lower part; leaves narrow, acuminate,

Explanation to Plate VIII

1. *Cryptis aculeata* (L.) Alt., a branch with inflorescence: a) spikelet; b) inflorescence in section. -
2. *C. turkestanica* A. Elg., a branch with inflorescence: a) spikelet; b) inflorescence in section. -
3. *C. schoenoides* (L.) Lam., inflorescence; a) spikelet. - 4. *C. alopecuroides* (Pill. et Mitt.) Schrad., inflorescence, a) spikelet. - 5. *C. Borszczowi* Rgl., inflorescence; a) spikelet. - 6. *Rhizocephalus turkestanicus* (Litw.) Roshev. a) general view; b) spikelet; c) glumes; d) floret; e) spikelet without glumes; f) and g) lemma and palea; h) leaf with sheath and ligule.

more or less involute; ligule ciliate. Inflorescence cylindric, to 8 cm long and 8 mm broad, spike-like; spikelets ca. 2 mm long, lanceolate; glumes with ciliate keel; lemmas membranaceous; lemma with 1 keel, palea with 2 keels. Stamens 3. June–September. (Plate VIII, Figure 4, a).

Wet sandy and saline soils. – European part: Upp. Volg., Volg.–Kam., Upp. Dnep., Volg.–Don., Zavolzh., Prichern., Low. Volg.; Caucasus: Ciscauc., Dag., East. Transcauc.; West. Siberia: Irt.; Centr. Asia: Aral.–Casp., Kara–Kum. Gen. Distr.: Medit., Balk.–As. Min., Iran. Described from Hungary.

5. C. Borszczowi Rgl. in Bull. Soc. Nat. Mosc. XLI, 2 (1868) 306. – *Heleochoa Borszczowi* Roshev. ex Fedchenko. Spis. russk. v Izv. Bot. Sada (List of Russ. Plants in Bot. Gard. News). Suppl. II (1914) 52.

Annual. Tufted; culms 5–20 cm tall, ascending, puberulent; leaf sheaths pilose-pubescent, not reaching up to inflorescence or, more rarely, enveloping only its lower part; leaves linear, flat or more or less involute, pubescent-pilose, more rarely glabrous underneath; ligule ciliate. Inflorescence oblong or cylindric, 1–6 cm long and 0.5 cm broad, spike-like; spikelets 3–4 mm long, lanceolate; glumes hyaline, with keel extended into a point; keel and upper part of body ciliate; lemma pubescent above, with keel extended, into a point as in the glumes. Palea with 2 keels. Stamens 3. June–August. (Plate VIII, Figure 5, a).

In river valleys, on wet loams and saline sites. – European part: Low. Volg.; West. Siberia: Irt. (Atbasar Raion); Centr. Asia: Aral.–Casp. Endemic. Described from Ust Urt (25 September, 1857, Borshchov). Type in Leningrad.

Genus 107. RHIZOCEPHALUS* BOISS.

Boiss. Diagn. ser. I, V (1844) 68.

Inflorescence dense, more or less capitate, surrounded by leaf sheaths. Spikelets 1-flowered, laterally compressed, subsessile. Glumes coriaceous, 3-nerved, urceolate. Lemma 5-nerved, also coriaceous, longer than the glumes, somewhat enlarged in lower part, its hyaline margins enveloping the invariably 2-keeled palea. Stamens 2. Lodicules wanting. Ovary oblong with 2 long, weakly plumose stigmas. Small annuals, with obsolete culms.

1. *R. turkestanicus* (Litw.) Roshev. comb. nova–*Heleochoa turkestanica* Litw. sp. nov. in Addenda p. 743.

Annual. Roots thin, fibrous; the entire plant 2–3 cm tall; culms 0.5–1.0 cm tall, densely leafy; leaf blades to 3 cm long and 1–1.5 mm broad, membranaceous on the margin, rather flat, surrounding the inflorescence; ligule very short, cleft. Inflorescence more or less capitate or with a short axis, many-flowered, covered by leaf sheaths; glumes ca. 3 mm long, urceolate, somewhat inflated and enlarged in upper part, with hyaline margin and an extremely short point, glandular-pubescent on the nerves; lemma

* From Greek *rhiza* = root, and *kephale* = head.

ca. 5 mm long, narrowly lanceolate, convolute, somewhat enlarged in lower part, glandular-pubescent on the veins; palea narrowly lanceolate, ca. 4 mm long, hyaline, glabrous. Lodicules ca. 0.5 mm long. April.-(Plate VIII, Figure 6, a-h).

Sandy steppes.-Centr. Asia: Pam.-Al. Endemic. Described from Uzbekistan (Kermine). Type in Leningrad.

Genus 108. PHLEUM* L.**

L. Gen. pl., ed. I (1737) 14.

Inflorescence a spikelike panicle, contracted, dense, cylindrical; its branches free or adnate to main axis. Spikelets small, 1-flowered, oblong, more or less compressed laterally. Glumes subequal, keeled, free, produced at the summit into a point or awn, more rarely obtuse, longer than the lemmas. Lemmas hyaline, awnless; palea 2-nerved; lodicules 2 or lacking. Styles straight, with stigmas plumose above or nearly from the base. Caryopsis free, oblong-oval. Annual and perennial plants growing in small tufts or producing solitary culms. Leaves rather firm, lanceolate or linear, convolute in the bud, with glabrous or puberulent sheaths.

1. Panicle with free branches which are not adnate to main axis, and hence appearing lobed when bent. 2.
- + Panicle with branches almost entirely adnate to main axis, and hence retaining its cylindrical shape when bent 9.
2. Annuals 3.
- + Perennials 7.
3. Lemma 5-nerved 4.
- + Lemma 3-nerved 5.
4. Glumes lanceolate, long-pectinate-ciliate along the keel, not swollen, with long-pointed, divergent tips 5. *Ph. graecum* Boiss. et Heldr.
- + Glumes subovate, with short-pointed, convergent tips, glabrous or short-ciliate on the keel 1. *Ph. tenue* Schrad.
5. Spikelets cuneate-triangular, subobcordate with swollen glumes which terminate in a straight, short awn-point 4. *Ph. paniculatum* Huds.
- + Spikelets lanceolate or lance-oblong, glumes not swollen 6.
6. Culms short and entire plant small; glumes lanceolate, narrow on both sides, pointed, straight at the tip, not divergent, with three distant and prominent nerves, long-ciliate on the keel; lemmas ca. 1/4 as long as the glumes 3. *Ph. arenarium* L.
- + Culms longer; glumes oblong-ovate, with outward-bent tips 2. *Ph. Boissieri* Bornm.

* From Greek *phlees* = name of a marsh plant mentioned by Aristophanes.

** Compiled by P. N. Ovchinnikov.

7. Glumes scabrous or short-ciliate on the keel, extending into a short aristate point. 6. *Ph. phleoides* (L.) Simk.
 + Glumes long-ciliate on the keel. 8.
 8. Glumes pubescent, tapering to a point; panicle rather loose, often somewhat interrupted below; spikelets elongate-lanceolate.
 8. *Ph. Michellii* All.
 + Glumes pectinate-ciliate only on the keel; inflorescence compact; spikelets oblong. 7. *Ph. montanum* C. Koch.
 9. Annual or biennial plant, mostly up to 20 cm tall; inflorescence usually ovoid; lower spikelets reflexed; glumes rounded at the summit and abruptly terminating in an awn to 5 mm long; leaves narrow, to 3 mm in width. 9. *Ph. echinatum* Host.
 + Taller perennial plants, from 15 to 100 cm tall, leaves flat, from 3 to 8 mm broad; all spikelets pointing upwards; glumes truncate, flat, awned from the blunt summit. 10.
 10. Sheath of uppermost leaf very slightly enlarged or not at all; inflorescence cylindrical; the point of glume much shorter than the body. 10. *Ph. pratense* L.
 + Uppermost sheath on the culm inflated; inflorescence ovoid or short-cylindrical; the point of glume about as long or longer than the body. 11. *Ph. alpinum* L.

129 Section 1. *Achnodon* Griseb. in Ldb. Fl. Ross. IV (1853) 455. - *Achnodonton* P. B., Agrost. (1812) 24. - *Achnodon* Nees, Gen. pl. Germ. I (1843). - Panicles with free branches. Rachilla prolonged above the base of lemmas into a rudimentary stipe. Caryopsis laterally compressed.

1. *Ph. tenue* Schrad. Fl. Germ. (1806) 191; Griseb. in Ldb. Fl. Ross. IV, 455; Shmal'g. Fl. II, 601. - *Phl. tenue* Trin. Fund. Agrost. (1820) 127. - *Achnodonton tenuis* P. B. Agrost. (1812) 146. - Ic.: Rchb. Ic. Fl. Germ. I 31, t. 50, f. 1481.

Annual. A plant with numerous thin, hard, erect or ascending culms; leaves narrowly linear, scabrous on the margin; ligule elongate. Panicle long-cylindrical, rounded at the base, glaucous-green; glumes curved in on the back, short-pointed, with three prominent, distant nerves, glabrous on the keel, twice as long as the lemmas, membranaceous between the nerves and on the margin; lemma and palea membranaceous, subequal, 5-nerved, ovate; lemma dentate-truncate at the tip. May-June. (Plate IX, Figure 1).

Grassy, dry sites in coastal areas and mountains. - European part: Crimea; Caucasus: Ciscauc., East, Transcauc. (along Caspian coast). Gen. Distr.: Medit., Balk. - As. Min. Described from Istria. Type in Munich.

Section 2. *Chilochloa* (P. B.) Griseb. in Ldb. Fl. Ross. IV (1853) 456. - *Chilochloa* P. B. Agrost. (1812) 37; Nees, Gen. plant. Germ. I (1843) t. 9, 11.

Panicles with free branches. Rachilla prolonged above the base of lemmas into a rudimentary stipe. Caryopsis ovate-oblong, terete.

2. *Ph. Boissieri* Bornm. in Magyar. Bot. Lap. (1912) 20. - *Ph. ex-aratum* Hochst. in Kotschy. exsicc. 1843 (nom. nud.); Boiss Fl. Or. V (1884) 480.

Annual. Plant with numerous erect [or] ascending, rather coarse culms; leaves linear-lanceolate, stiffly scabrous on the margin. Inflorescence compact, long-cylindrical; spikelets distinctly compressed, ovate; glumes more or less coriaceous, oblong, with 3 raised nerves, sparingly ciliate on upper part along the keel, pointed, somewhat recurved at the tip. Lemma and palea alike, about $1/4$ as long as the glumes, uniformly pubescent, 3-nerved, ovate, obtuse, more or less fringed at the summit. Lodicle 2-nerved. April-June. (Plate IX, Figure 2).

Dry hills. -Caucasus: Ciscauc. (near Veden). Gen. Distr.: Balk. -As. Min., West. Medit. Described from Asia Minor. Type in Weimar.

3. *Ph. arenarium* L. Sp. pl. (1753) 60; Griseb. in Ldb. Fl. Ross. IV, 456; Shmal'g. Fl. II, 601. -*Ph. arenarium* Trin. Fund. Agrost. (1820) 128. -Ic.: Rehb. Ic. Fl. Germ. I, t. 50, f. 1482; Smith, Engl. Bot., t. 222.

130 Annual. Plant with erect or ascending, low-growing culms; ligule elongate. Panicle oblong or short-cylindrical, finely attenuate at both ends, especially at base; spikelets compressed; glumes lanceolate, narrowed at both ends, pointed at summit, straight, not divergent, ciliate on the keel, membranaceous on the margin and between the nerves, about 3 times as long as the lemmas. Lemma obtuse, dentate-truncate at the tip, 3-nerved, May-June. (Plate IX, Figure 3).

Sandy wet coast. -European part: recorded for Upp. Dnep. and for Crimea. Gen. Distr.: Scand.(South.), Atl. Eur., West. Medit., Balk. -As. Min. Described from Europe. Type in London.

4. *Ph. paniculatum* Huds. Fl. Angl. ed. I (1762) 23; Rozhev in Fl. Az. Ross. (Fl. As. Russ.), ser. 1, No 2, IV (1924) 202. -*Chilochloa paniculata* P. B. Agrost. (1812) 37. -*Phleum asperum* Vill. Fl. Delph. II (1787) 61, tab. 2, fig. 4; Ldb. Fl. Ross. IV, 456; Shmal'g. Fl. II, 601.

Annual. Plants with solitary or few culms, to 30-50 cm tall. Sheaths smooth or scaberulous, the uppermost often inflated. Leaves broadly linear, very scabrous on the upper surface. Ligule elongate, 2-5 mm long. Inflorescence compact, stiffly scabrous, green, long, slender-cylindrical. Spikelets 2-2.5 mm long, laterally compressed, cuneate; glumes arcuately rounded, short-pointed. Glumes coriaceous, coarse, smooth or somewhat scaberulous, cuneate-obovate, narrowed at the base, broader, more or less swollen, blunt at the summit, terminating abruptly in a short, projecting, somewhat rounded-cylindrical point. Lemma and palea just over $1/2$ as long as the glumes, subobtuse. May-June. (Plate IX, Figure 4).

Sunny, dry slopes, stony places, derelict fields, southern steppes, and dry meadows. -European part: Crimea; Caucasus: Ciscauc., Dag., West. East, and South. Transcauc., Tal.; Centr. Asia: Upp. Turkm., Amu-Dar., Syr-Dar., Kyz. -Kum. (?), Pribalkh. Gen. Distr.: Atl. Eur., Balk. -As. Min., Iran. Described from England. Type in London.

ECONOMIC IMPORTANCE. Ranking as an inferior pasture grass.

5. *Ph. graecum* Boiss. et Heldr. in Boiss. Diagn., ser. 1, XIII (1853) 42. -*Ph. arenarium* Hock. f. Fl. of Brit. Ind. VII (1897) 237, non L. -*Ph. exaratum* Griseb. Spicil. fl. Rumel. II (1844) 463, non Hochst.

Annual. Plants with slender, erect or geniculate-ascending culms 10-40 cm tall; uppermost sheaths more or less inflated; ligule 2-4 mm

long, elongate, rather pointed. Inflorescence light green, dense, cylindrical, 1-10 cm long; spikelets to 5 mm long, with narrowly lanceolate, non-swollen, long-pointed glumes; glumes with sideward-bent tips, with membranaceous margin; lemmas hyaline, about $1/4-1/3$ as long as the glumes; lemma 5-nerved, blunt; palea narrower, 2-nerved. May-June. (Plate IX, Figure 5).

Grows in dry meadows and on mountain slopes up to 2,700 m. - Centr. Asia: Syr-Dar. (near Uzgent, May 1880, A. Regel¹). Gen. Distr.: South-Eastern Europe, Asia Minor, Punjab, and Kashmir. Described from Greece. Type in Geneva.

- 131 6. *Ph. phleoides* (L.) Simk. En. Fl. transs. (1886) 563. - *Phalaris phleoides* L. Sp. pl. (1753) 55. - *Phleum Boehmeri* Wib. Prim. fl. Werth. (1799) 125; Griseb. in Ldb. Fl. Ross. IV, 456; Shmal'g. Fl. II, 600; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 189. - *Chilochloa Boehmeri* P. B. Agrost. (1812) 37. - Ic.: Rchb. Ic. Fl. Germ. I, t. 51, f. 1488.

Perennial. Forms loose tufts, sometimes with short rhizomes; culms usually fairly numerous, erect, up to 80 cm and more in height; leaves grayish-green, to 4 mm broad, sharply scabrous on the margins, flat or sometimes folded. Inflorescence grayish-green, narrow-cylindrical, more or less compact; spikelets oblong, to 3 mm long, laterally compressed; glumes coriaceous-hyaline, with a curved, indurate keel, terminating in a short aristate point, keel and point very scabrous. Lemmas $1/3-1/4$ shorter than the glumes. May-July. (Plate IX, Figure 6, a).

Dry meadows, steppes, hills, and stony slopes. - European part: all regions, except Kar. - Lap. and Dv. - Pech.; Caucasus: all regions; West. Siberia: all regions; East. Siberia: Yenisei, Ang. - Sayan., Daur.; Centr. Asia: Aral. - Casp., Pribalkh., Dzung. - Tarb., Syr-Dar., Pam. - Al., Tyan'-Shan. Gen. Distr.: Southern part of Scand., Centr. Eur., Corsica, Balk. - As. Min., East. Medit., Dzung. - Kashg., Mong. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Of great value as a good fodder plant in steppe pastures and in hay; but inferior to common timothy (*Phl. pratense* L.).

7. *Ph. montanum* C. Koch. in Linnaea XXI (1848) 383. - *Ph. Boehmeri v. ciliatum* Griseb. in Ldb. Fl. Ross. IV (1853) 457. - *Ph. Boehmeri* C. A. M. in Beitr. z. Pflanzenk. d. Russ. Reich. VI (1849).

Differs from the preceding species in narrowed ligule and oblong-lanceolate glumes with broadly membranaceous margin and tapering gradually to an aristate point, long-pectinate-ciliate down the entire length of the keel. Inflorescence narrowly cylindrical, 4-8 cm long; spikelets ovate. July. (Plate IX, Figure 7).

Dry slopes of alpine and subalpine meadows. - Caucasus: Ciscauc., West. East, and South. Transcauc. Gen. Distr.: Balk. - As. Min. Described from the frontier parts of Turkey. Type in Leningrad.

NOTE. A valuable fodder plant, apparently not inferior to *Ph. phleoides* (L.) Simk.

8. *Ph. Michellii* All. Fl. Ped. II (1785) 233; Griseb. in Ldb. Fl. Ross. IV, 456; Shmal'g. Fl. II, 601. - *Chilochloa Michellii* Trin. Gram. unifl. (1824) 167. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 51, fig. 1489.

Perennial. Rhizome short, almost creeping, roots fibrous; leaves broadly linear, acute. Panicle elongate, cylindrical, loose, often interrupted at the base; glumes 3-nerved, narrowly lanceolate, gradually tapering to a rather long, aristate point, directed slightly sideways, hairy, long-ciliate on the keel, scarious on the margin; lemma and palea 1/3 shorter than the 132 glumes, subobtusely. June-July. (Plate IX, Figure 8).

Mostly stony and forest-covered mountain slopes, and rocks. -Caucasus: West. and South. Transcauc. (Loriiskaya Steppe). Gen. Distr.: Centr. Eur., Balk. -As. Min., West. Medit. Described from Italy. Type in Turin (Italy).

Section 3. *Euphleum* Griseb. in Ldb. Fl. Ross. IV (1853) 457. -Inflorescence branches almost completely adnate to main axis; the compact, spike-like panicle not lobed when bent. Rudimentary vestige of rachilla above the base of lemmas absent.

9. *Ph. echinatum* Host, Gram. austr. III (1805) 8, tab. II.

Biennial or annual. Plants up to 20 cm tall, growing in clumps; leaves to 3 mm broad and to 8 cm long; inflorescence more or less oblong or ovoid, lower spikelets reflexed; glumes rounded at the tip and abruptly terminating in divergent awns up to 5 mm long. April-June. (Plate IX, Figure 9).

European part: Crimea (occurrence needs confirmation). Gen. Distr.: Medit. (Italy, Dalmatia), Balk. -As. Min. Described from Dalmatia. Type in Tubingen.

10. *Ph. pratense* L. Sp. pl. (1753) 59; Griseb. in Ldb. Fl. Ross. IV, 457; Shmal'g. Fl. II, 600; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 187. - *Ph. nodosum* L. Syst. ed. 10 (1759) 871. - *Ph. bulbosum* Host, Gram. austr. IV (1809) 12, tab. 21. Ic.: Rechb. Ic. Fl. Germ. I, tab. 50, fig. 1483, 1484. - *Ph. Roshevitzii* Pavl. in Bull. Jard. Bot. URSS XXX (1932).

Perennial. Rhizome short with numerous fibrous roots, the lower internodes sometimes tuberously enlarged (var. *nodosum* (L.) Coss.); forming loose, tall tops, 60-100 cm in height, rarely sprawling and then attaining 25-40 cm; culms erect, more rarely ascending, mostly partially; leaves profuse, flat, from 3 to 10 mm broad, sharply scabrous; panicle spike-like, compact, cylindrical; spikelets small, oblong-cuneate, laterally compressed; glumes hyaline, oblong, obtuse-truncate at the tip and terminating in a short aristate point; lemma and palea about 1/2 as long as the glumes, obtuse-truncate, serrulate at the tip. June-July. (Plate IX, Figure 10).

Grows in relatively dry meadows, sometimes in forests exposed to light after thinning, more rarely by the side of roads, cultivated fields, etc., not ascending to great heights in the mountains. -European part: all regions (from arctic Europe down to Crimea); Caucasus: Ciscauc., West., South. and East, Transcauc., Gr. Cauc., Talysh, Dag.; Centr. Asia: Dzung. -Tarb., Tyan'-Shan; West. Siberia: all regions; East. Siberia: Yenisei, Ang. -Sayan, rarely in Daur. and South. Len. -Kol.; Far East: Ussur., Ze. -Bur., and Sakhalin. Gen. Distr.: Europe, Asia Minor, North Africa. It was imported into North America where it has been introduced into cultivation and now also occurs wild. Imported into Australia. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. One of the best perennial fodder grasses for hay cutting which have been introduced into cultivation, not only in the U.S.S.R., but also in other countries, especially in America.



11. *Ph. alpinum* L. Sp. pl. (1753) 59; Griseb. in Ldb. Fl. Ross. IV, 459; Shmal'g. Fl. II, 600; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 188. - *Ph. commutatum* Gaud. in Alpina III (1808) 4 et in Agrost. I (1811) 40. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 50, fig. 1485 and 1480.

Perennial. From 10 to 40 cm tall, with a short creeping rhizome, forming loose tufts; culms ascending, with glabrous sheaths, occasionally tinged with dark purple shades, the uppermost sheath inflated; leaves broadly linear, glabrous, smooth or rather scabrous on the margin. Inflorescence dense, short-cylindrical or ovoid-oblong; glumes oblong, broadly hyaline, with long, stiff cilia on the keel, tapering toward the tip to an aristate point about twice as long as the body, more rarely shorter; lemma rounded-toothed. August-September. (Plate IX, Figure 11).

Tundra, and alpine and subalpine meadows up to 3,600 m. - Arctic: Arct. Eur., Arct. Siberia; Caucasus: Gr. Cauc., West. and East. Transcauc.; West. Siberia: Alt.; East. Siberia: Ang.-Sayan.; Far East: Kamch.; Centr. Asia: everywhere in high-mountain regions. Gen. Distr.: North. and Alp. regions of Europe, Asia, North America, Mexico, and southern extremity of South America. Described from Lapland. Type in London.

ECONOMIC IMPORTANCE. A good fodder plant in pasture, eaten most readily by all kinds of livestock, especially by sheep and horses.

Genus 109. *ALOPECURUS** L.**

L. Gen. pl. ed. 1 (1737) 18; Sp. pl. ed. 1 (1753) 60.

Inflorescence a panicle forming a dense, contracted, cylindrical or ovoid-ovaliform false spike, more rarely almost round with short branches appressed to main axis. Spikelets 1-flowered, nearly always with reduced palea. Glumes subequal, mostly united only at the base, more rarely up to the middle, obtuse (Series 4. - *Annuae*), pointed or terminating in a
135 more or less developed awn-point (Series 1. - *Vaginatae*). Lemma hyaline, surrounding the ovary, with margins united below and a rather long dorsal awn (Series 1. - *Vaginatae*). Stamens 3. Stigmas usually united at the base of the pistils, long, plumose-filiform, exerted from summit of spikelet. Grain oblong, laterally compressed, falling freely together with lemma. Annual or perennial grasses, forming loose tufted tops with creeping rhizomes, or compact tufts with tuft-forming rhizomes, or producing solitary blades.

1. Spikelets urceolate†-oblong or urcinate-infundibular 2.
+ Spikelets elliptic or oblong-ovate 13.

* From Greek *alopek*-fox, and *oura*-tail.

** Compiled by P. N. Ovcchimkov.

† urceolate (urn-shaped) - with spreading tips (see Plate X, Figure 1a).

Explanation to plate IX

1. *Phleum tenue* Schrad. -2. *Phl. Boissieri* Bornm. -3. *Phl. arenarium* L. -4. *Phl. paniculatum* Huds. -5. *Phl. graecum* Boiss. et Heldr. -6. *Phl. phleoides* (L.) Smk. -7. *Phl. montanum* C. Koch. -8. *Phl. Michellii* All. -9. *Phl. echinatum* Hor. -10. *Phl. pratense* L. -11. *Phl. alpinum* L. -In all the drawings spikelets are denoted by figures and glumes by the letter a.

2. Spikelets densely hairy all over the surface; lemma and palea always shorter than the glumes 3.
- + Glumes ciliate-hairy on keels and nerves, on the remaining surface naked, or with scattered or short-appressed hairs 9.
3. Spikelets distinctly urceolate; glumes mostly erect, terminating in a slender awn 4.
- + Spikelets infundibular, with glumes terminating in divergent awn-points 6.
4. Spikelets not exceeding 4-6 mm in length; plants with compact tufts, covered with dead sheaths of the lower leaves, of which at least some are clothed with woolly hairs 3. *A. textilis* Boiss.
- + Even when plants tufted, sheaths of lower leaves never clothed with woolly hairs 5.
5. Spikelets to 8 mm long, large; radical leaves flat, to 3 mm long. Some sheaths of dead leaves slightly hairy 2. *A. tiflisiensis* (Westb.) Grossh.
- + Spikelets 4.5-6 mm long; radical leaves setaceous-linear; all sheaths of lower leaves glabrous; culm leaves 1-2, with enlarged, pointed sheath and nearly always with reduced blades 1. *A. vaginatus* Pall.
6. Glumes united almost solely at base 7.
- + Glumes united, on the outside of spikelet from the lower 1/3 and on the inside from the middle or above it; ligule truncate or rounded-obtuse, to 1.5-2 mm long; inflorescence to 3.5 cm long, broadly oval-cylindrical, with the geniculate awns of the spikelets protruding in all directions 7. *A. brachystachyus* M.B.
7. Tall plant, 25-75 cm in height, with oval or oval-oblong, densely hairy, often somewhat purple-tinged inflorescence, without creeping rhizomes; spikelets to 4.5 mm long; glumes tapering into short, aristate points 6. *A. himalaicus* Hook. f.
- 137 + Plant not exceeding 20-35 cm in height, often with almost round, hairy inflorescences; glumes terminating in aristate, divergent points ... which are often as long as the body 8.
8. Plant with long creeping rhizomes; at the base of the slender culms there are reticulate fibers of dead lower sheaths 5. *A. Aucheri* Boiss.
- + Plant without creeping rhizomes, with flat radical leaves 1.5-3 mm broad, and often with somewhat inflated overlapping, sheaths 4. *A. dasyanthus* Trautv.
9. Glumes pointed-aristate at the tip 10.
- + Glumes pointed, but never terminating in an awn-point 11.
10. Plant loosely tufted, with long creeping stolons 9. *A. mucronatus* Hack.
- + Plant without creeping stolons, with a thickened rhizome; lemma awned from somewhat below the middle 13. *A. Gerardi* Vill.
11. Spikelets covered all over with silky hairs; inflorescence rather loose; awn not longer than the spikelet, rarely exceeding it in length 12. *A. sericeus* Alb.
- + Spikelets ciliate-hairy only on the keel and to some extent on the nerves of glumes, or with scattered short, appressed hairs, visible with the aid of a strong magnifier, on internerves in the lower part; inflorescence compact 13.

12. Lemma shorter than the glumes, awned from the lower 1/4, awn geniculate, exceeding the spikelet by 2-2.5 mm; glumes dark red at the summit, hence the entire inflorescence appears grayish-purple-red 10. *A. apicatus* Ovcz.
- + Lemma about as long as glumes, with obsolete awn, or else awn as long as the spikelet, more rarely exceeding it slightly in length; inflorescence turning black as fruits ripen 11. *A. ventricosus* Pers.
13. Perennial plants, often forming rather compact tufted clumps ... 14.
- + Annual plants, often with ascending or prostrate, geniculate culms 25.
14. Glumes densely hairy all over 15.
- + Glumes long-ciliate-hairy on the keel and sometimes also on the nerves, or sometimes with scattered short, appressed hairs on the internerves as well 22.
15. Inflorescence loose, more or less cylindrical 16.
- + Inflorescence compact, subglobose, oval, or oval-cylindrical ... 17.
- 138 16. Lemma shorter than the glumes, obliquely truncate, tapering toward the summit or acuminate, terminating in rather long ciliate hairs and a slender, flexuous-geniculate awn ... 18. *A. glacialis* C. Koch.
- + Lemma nearly as long as the glumes, obtuse-rounded, with minute hairs at the summit and sometimes on the sides, and with very short cilia on the keel; awn straight, not exceeding 2-2.5 mm, projecting above the spikelet 21. *A. Roshevitzianus* Ovcz.
17. Inflorescence broadly round-oval, with large spikelets (to 5.5 mm long), covered with yellowish-white hairs ... 24. *A. Steinergeri* Vasey.
- + Inflorescence short-oval or more or less cylindrical, grayish or glaucous-purple 18.
18. Mostly low-growing plants, with rather strongly inflated sheaths of at least the upper leaves; leaves broad, flat, and short; blades of culm leaves shorter than the sheaths 19.
- + Tall plants, mostly glaucous-green, with amplexicaul sheaths, more rarely the sheath of uppermost leaf enlarged; leaves long, 1.5-5 cm in length, flat or folded 20.
19. Inflorescence round-oval or oval, with broadly ellipsoid spikelets borne on distinct pedicels; the tips of glumes somewhat divergent; culm fairly stout, often with overlapping, nonamplexicaul sheaths; awn projecting as much as 1.2-2 mm beyond the spikelet, attached just above the base of lemma 23. *A. borealis* Trin.
- + Inflorescence oval-cylindrical; awn obsolete or, when developed, not exerted or only slightly exerted from the glumes, attached slightly below the middle of the lemma 22. *A. alpinus* Sm.
20. Inflorescence mostly purple-tinged, covered with silky hairs, short-oval or short-cylindrical, 0.8-1.2 cm long; spikelets broadly ellipsoid, 3.5-4 mm long; leaves long, 1.5-2(3) mm broad 20. *A. tenuis* Kom.
- + Inflorescence mostly cylindrical, longer, glaucous-gray or motley glaucous-grayish; leaves broader; spikelets ellipsoid, with convergent glume tips 21.
21. Ligule 1.5-2 mm long, mostly convolute; leaves abundant, glaucous-green like the entire plant, flat, up to 4-5 mm broad 18. *A. glaucus* Less.

- + Ligule to 3 mm long, rounded; leaves long, 3-4 mm broad, often folded and in this case narrower; tips of glumes dark purple, hence the entire inflorescence appears somewhat motley 18. *A. pseudobrachystachyus* Ovcz.
- 139 22. Inflorescence long, cylindrical, rather loose, often somewhat interrupted below; spikelets large, to 7 mm long; lemma pointed, slightly projecting above the divergent glumes 15. *A. laxiflorus* Ovcz.
- + Inflorescence compact, cylindrical or oval-cylindrical. Spikelets smaller 23.
23. Spikelets rather broadly ovate; tips of glumes slightly divergent, never connivent; lemma pointed, its upper part unevenly hairy; glumes covered on the internerves with scattered, appressed, short hairs; anthers 3 mm long 16. *A. seravschanicus* Ovcz.
- + Spikelets elliptical; lemma short-ciliate only on the back or above on the margin, gradually tapering or produced into a small point ... 24.
24. Sheath or uppermost leaf somewhat dilated; inflorescence glaucous-purple; awn slender, flexuous, exserted to 1.5-3 mm beyond the spikelet, attached slightly below the middle or on the lower 1/3 of the lemma which is produced into a small point; internerves of glumes glabrous or covered with scattered, appressed hairs; spikelets 4-5 mm long 17. *A. soongoricus* (Roshev.) V. Petr.
- + Sheaths adhering to the culm; inflorescence greenish-gray; awn attached slightly above the base of the acuminate lemma, long, exserted to 6 mm 14. *A. pratensis* L.
25. Spikelets glabrescent; glumes united nearly up to half their length or more, with very short cilia on the keel 25. *A. myosuroides* Huds.
- + Spikelets more or less ciliate-hairy; glumes united only at base ... 26.
26. Awn long, straight, exserted to 5 mm; inflorescence rather loose, laterally compressed 26. *A. longiaristatus* Maxim.
- + Awn shorter, inflorescence cylindrical, compact 27.
27. Awn geniculately bent sideways, stout; anthers mostly purple, more or less oblong 27. *A. geniculatus* L.
- + Awn slender, straight or almost obsolete; anthers small, round, orange or yellow 28.
28. Awn exserted 3 mm 28. *A. amurensis* Kom.
- + Awn as long as spikelet or exserted not more than 0.5-0.7 mm 29. *A. aequalis* Sobol.

140 Series 1. *Vaginatae* Ovcz. - Perennials. Spikelets urceolate-oblong, constricted at the base of the extended, thin, acute tips of glumes, or in fundibular-elliptical, the tips of glumes being aristate. Lemma always shorter than the glumes, with a long, geniculate awn.

1. *A. vaginatus* Pall. Ind. Taur. (1795) 94 nom. nud. et Nova Act. Petrop. X (1797) 304: Griseb. in Ldb. Fl. Ross. IV, 461: Shmal'g. Fl. II, 602. - *Colobachne vaginatum* P.B. Agrost. (1812) 22. - *Alopecurus Pallasii* Trin. Fund. Agrost. (1820) 59. - *A. angustifolius* Sibth. Fl. Graec., tab. 64. - *A. Cassius* Boiss. Diagn. ser. 1, XIII (1853) 41. - Ic.: Trin. Sp. gram. I (1828), tab. 2

Perennial. Tufted, with naked sheaths of dead radical leaves; leaves narrowly linear; culms erect, with 1-2 inflated, pointed sheaths and

strongly reduced leaf blades. Inflorescence compact, hairy, subovoid or ovoid-oblong; spikelets 4.5-6 mm long, urceolate-elliptical; glumes almost free, covered with silky hairs, tapering into a more or less elongated, slightly divergent point; lemma with a cluster of short hairs at the summit, obliquely truncate, blunt, awned from below its middle, awn up to twice as long as the spikelet; lodicule often developed, narrowly linear, with scarcely perceptible hairs at the summit; anthers to 3 mm long. May-June. (Plate XI, Figure 6, a, b, c).

Dry slopes and stony sites in foothill regions, also ascending into the alpine area. -European part: Crimea; Caucasus: Ciscauc., West. and East. Transcauc., Dag., Gr. Cauc. Gen. Distr.: Balk. -As. Min. Described from Crimea. Type in Leningrad.

ECONOMIC IMPORTANCE. Of some importance as a forage plant in natural pastures.

2. *A. tiflisiensis* (Westb.) Grossh. in Sched. ad Herb. Pl. or. exsic. III (1924) 15; Sosnovsk., Grossg., Shishkin, Fl. Tifl. I (1925) 40. -*A. vaginatus* ssp. *pubescens* var. *tiflisiensis* Westb. Tr. Yur'. Bot. Sada (Bull. Yur'. Bot. Gard.) V (1905) 23. -*A. lasiochlamys* Boiss. et Kotschy in sched. herb.

Perennial. Forming rather dense tufts; the dead sheaths at the base sometimes somewhat hairy; radical leaves flat, long, as much as 30 cm long, to 3 mm broad, often as long or longer than the culm. Inflorescence compact, to 3 cm long and 1.5 cm broad, oblong-cylindrical; spikelets to 8 mm long, tips of glumes long, aristate; lemma acuminate, slightly curved sideways, with a row of rather long hairs; lodicule, if developed, to 4 mm long; anthers to 4 mm long. April-July. (Plate XI, Figure 7).

Stony slopes and rocks in the alpine and subalpine zones of the Caucasus, up to 3,000 m. -Caucasus: Gr. Cauc. East. and South. Transc., Tal. Endem. Described from environs of Tiflis. Type in Tiflis.

3. *A. textilis* Boiss. Diagn. ser. 1, XIII (1853) 40; Rozhev. in Fl. Az. Ross. (Fl. As. Russ.) Ser. 2, IV (1924) 216. -*A. vaginatus* ssp. *pubescens* var. *textilis* Westb. Tr. Yur. Bot. Sada (Bull. Yur. Bot. Gard.) V (1904) 23.

Perennial. Plant forming compact tufts, with a short rhizome and a large number of roots; at the base of culms there are numerous remains of lower sheaths which are firm, appressed-hairy on the outside, later often disintegrating into fibrous tissue closely enveloping the base of the plant; radical leaves narrowly linear, canaliculate, coarse; sheaths of culm leaves elongated, occasionally inflated. Inflorescence spikelike, compact, hairy, oval or oblong-oval; spikelets to 4-5 mm long; glumes united merely at the base, extending into straight points, somewhat longer than the lemma, long-hairy on the keel, hairy on the lateral nerves, and pubescent on the internerves; lemma obliquely truncate, pointed at the summit, awned from its lower part, awn geniculate, bent sideways. June-July. (Plate XI, Figure 8).

Dry stony slopes and rocks, and subalpine meadows, up to 3,000 m. -Caucasus: East. and South. Transcauc.; Centr. Asia: Upp. Turkm. (Kopet Dag). Gen. Dist.: Iran, Arm. -Kurd., and As. Minor. Described from northern Persia. Type in Geneva.

4. *A. dasyanthus* Trautv. in A. H. P. V. (1878) 486. -*A. vaginatus* β *unipaleaceus* Boiss. Fl. Or. V (1884) 489. -*A. vaginatus* ssp. *euvaginatus* var. *dasyanthus* Westb. Tr. Yur. Bot. Sada (Bull. Yur.



Bot. Gard.) V (1904) 21, 24. - Exs.: Herb. Fl. Cauc. No 107.

Perennial. A rather small, tufted plants, with few or solitary culms, 7-24 (-38) cm tall, covered with frequently overlapping, upper, inflated sheaths of 2-4 culm leaves; leaves lanceolate or linear-lanceolate, 1.5-3.5 mm broad, acuminate, often glabrous; ligule rather blunt, oblong-attenuate, 3-4 mm long. Inflorescence compact, short-oval or subglobose, to 1.7 cm long, 1.0-1.2 cm broad, pilose, grayish-white; spikelets to 4 mm long, broadly obconical, densely hairy; tips of glumes thin, pointed, divergent, long; lemma 1-1.5 mm shorter than the glumes, obliquely short-truncate, subobtusate, awned from its lower 1/3, awn weakly geniculate, stoutish, more than twice as long as the spikelet, finely short-ciliate at the summit; anthers to 2 mm long, oblong. June-July. (Plate XI, Figure 9).

- 144 Stone drifts and subalpine meadows in mountains. -Caucasus: Gr. Cauc., Dag., East., South., and West. Transcauc. Gen. Distr.: Turkish Armenia.

5. *A. Aucheri* Boiss. Diagn. ser. I, XIII (1853) 41. -*A. vaginatus* subsp. *Aucheri* Westb. Tr. Yur. Bot. Sada [Bulletin of Yur. Bot. Gard.] V (1904) 22.

Perennial. Rather low, loose tufts, up to 30 cm in height, with long, creeping, rooting shoots; culms slender, with 2-3 leaves; leaves linear, narrowly acuminate, glabrous; sheaths of culm leaves elongate-dilated. Inflorescence spike-like, ovoid-oblong or rounded-oval, short, compact, silky whitish-gray; spikelets 3.5-5 mm long, finely silky-hairy, obconical or infundibular; glumes with long, straight, divergent, the fine tips terminating in a slender awn, sometimes nearly as long as the glume; awn, attached on the lower 1/3 of the narrowly oblong lemma, flexuous or geniculate at the base, slender, twice as long as the spikelet. Anthers to 2 mm long. June.

Alpine meadows and hillsides. -Caucasus: Gr. Caucasus, South. Transcauc. Gen. Distr.: Arm.-Kurd., Iran. Described from northern Persia. Type in Geneva.

6. *A. himalaicus* Hook. f. Fl. of Br. Ind. VII (1897) 238; Rozhev. in Fl. Az. Ross. (Fl. As. Russ.) Ser. 2, IV (1924) 217. -*L. gimalaiskii* [Himalayan].

Perennial. Plants 24-50 (78) cm tall, light green, forming small tufts or growing singly; radical leaves linear, upper leaves broader, green or glaucous, 1-3 mm broad, covered underneath with very short hairs; sheaths smooth, broader than the blades, the upper ones inflated; ligule to 4 mm long, rounded-pointed, oblong, serrulate on the margins. Inflorescence oblong, oval or subglobose-oval, 1-2.5 cm long and 1-1.2 cm broad, purplish-gray, more rarely whitish-yellow, with long, exerted, bent, often dark awns, pilose when young; spikelets 4-5 mm long, densely hairy; glumes united in lower 1/4, more or less divergent at the summit and terminating

Explanation to Plate X

1. *Alopecurus aequalis* Sobol. -*A. geniculatus* L. -3. *A. amurensis* Kom. -4. *A. longearistatus* Maxim. -5. *A. myosuroides* Hudk. -6. *A. glaucus* Less. -7. *A. pseudobrachystachyus* Ovcz. -8. *A. brachystachyus* M.B. -9. *A. Steinergeri* Vasey. -10. *A. alpinus* Sm. -11. *A. borealis* Trin. -12. *A. Roshevitzianus* Ovcz. -13. *A. songoricus* (Rozhev.) V. Petr. -15. *A. mucronatus* Hack. -16. *A. apicatus* Ovcz. -Annotations on all drawings: a-glume, b-lemma, c-ovary with styles, d-anther.

in a fine point, mostly recurved, dark purple, with dark purple nerves, long-pilose on the back and on the margins, with a hyaline fringe, rather short-pilose elsewhere; lemma much shorter than the glumes, ovate-oval, tapering toward the summit, winged, ciliate on one margin, awned from the lower third, awn long, barbed, dark, to 8 mm long. Anthers yellow, to 2 mm long. July-August.

Alpine meadows and stony slopes. -Centr. Asia: Pam. -Al. (Darvaz), rising up to 3,600 m. Gen. Distr.: Himalayas. Described from the Himalayas. Type in London.

7. *A. brachystachyus* M.B. Fl. taur.-cauc., III, Suppl. (1819) 56;
145 Griseb. in Ldb. Fl. Ross. IV, 462. -*A. colobachnoides* Trin. Fund. Agrost. (1820) 58. -*A. Vlassowii* Trin. Mem. Acad. Petersb., ser. 6, VI, 2 (1845) 42. -*A. alpinus* β *colobachnoides* Trin. l.c. -*A. baicalensis* Turcz. in herb. -*A. alpinus* Litw. (non Sm.) in HFR no 2699.

Perennial. Tall plant, mostly with several culms and a short-creeping rhizome, more rarely rhizome long-creeping, branching (var. *baicalensis* (Turcz.) Ovcz.); culms robust with flat, narrow, scaberulous leaves and smooth sheaths, inflated in uppermost leaf; ligule truncate- or rounded-obtuse, 1.5-2 mm long. Inflorescence to 3.5 cm long and 10 mm broad, oval- or broad-cylindrical, covered with white or slightly yellowish hairs, and with awns sticking out in all directions; spikelets to 5 mm long, suburceolate-elliptical; glumes united from the lower 1/3 or on one side from the middle or above it, pointed at the tip, more or less parallel, long-ciliate on the keel, faintly hairy on the internerves; lemma glabrous, awned from its lower 1/4, geniculate, finely barbed, exceeding the spikelet by 7-8 mm. June-July. (Table X, Figure 8).

Occurs on wet meadows. -East. Siberia: Ang. -Sayan., Daur.; Far East: Ze. -Bur. and adventitious (along railroads, etc.), in Ussur. region. Endemic. Described from Dauria. Type in Leningrad.

ECONOMIC IMPORTANCE. A plant of high fodder value, deserving consideration for introducing into cultivation.

8. *A. glacialis* C. Koch, in Linnaea XXI (1848) 382; Boiss. Fl. Or. V, 489. -*A. ponticus* c. Koch., l.c. -*A. gracilis* Trautv. in H.P.V. (1877) 486. -*A. tucheticus* Trautv. in A.H.P. IX (1884) 353.

Perennial. Tufts loose, 30-60 cm tall, with fibrous roots; sheaths of lower leaves thin, light brown, sometimes slightly appressed-hairy; culms long, slender, sometimes glaucous, flexuous and weak towards the apex; radical leaves to 2 mm broad, folded or flat, long, linear, flexuous; culm leaves linear-lanceolate, fully developed, their sheaths often glaucous, appressed, rarely very slightly dilated. Inflorescence spikelike, loose, sometimes interrupted below, oblong, 2-4 cm long, grayish, sometimes with a purple shade, covered with fine silky hairs; spikelets mostly obconical or oblong-elliptical, 3.5-5 mm long; glumes almost free, acute, hairy, with straight tips, exceeding the lemma; lemma obliquely truncate and hairy at the tip, awned from slightly above the base, awn twice as long as the spikelet; lodicule linear, often lacking, hairy at the end; anthers 2.2-3 mm. July. (Plate XI, Figure 10).

Meadows in the alpine zone, up to 2,400-3,300 m. -Caucasus: Gr. Cauc. and Dag. Gen. Distr.: Turkey (Lazistan). Described from the Pontic Crest. Type in Leningrad.

NOTE. With respect to a number of characteristics, this species is affiliated to the series *Vaginatae*; as regards the shape of spikelet and glumes, it comes close to the series *Alpinae* (to *A. Roshevitzianus* Ovcz.).

- 146 Series 2. *Ventricosae* Ovcz. - Perennials. Spikelets urceolate or urceolate-elliptical. Lemma with a short awn, not exerted or scarcely exerted, obliquely truncate or tapering into a small mucro.

9. *A. mucronatus* Hack. ex Paulsen in Kjoeb. Vidensk. Meddel. (1903) 162; Rozhev. in Fl. Az. Ross. (Fl. As. Russ.), Ser. 1. 2, IV (1924) 210. - *L. ostrokonechnyi* [sharp-pointed].

Perennial. Plant 4-18(-40) cm tall, with creeping, branching rhizomes, forming loose tufts; culms with dead, light brown, somewhat fibrillose sheaths at base; leaves 1-3.5 mm broad, up to 8-9 cm long, often reflexed to a nearly right angle, smooth, grayish-green, acuminate; sheaths of the uppermost leaf inflated, somewhat lustrous, sometimes glaucous-green, ribbed; ligule 1.5-2 mm long, rounded-obtuse, often lacerate. Inflorescence purplish, compact, with protruding dark purple awns, to 2 cm long and to 1 cm broad, short-oval, more rarely oval-cylindrical; spikelets 4-4.5 mm long, oblong-ovoid, suburceolate; glumes dark purple at the summit, united in lower 1/4, their hyaline margins somewhat overlapping, terminating in sharp points, parallel or slightly divergent, long-hairy on the keel and somewhat hairy on the nerves and in lower part; lemma shorter than the glumes, awned from its lower one-third, awn slightly bent, pointing sideways, exerted to 2 mm. July. (Plate X, Figure 15).

In the alpine zone (up to 4,500 m). - Centr. Asia: Pam. (Pamir, Shugnan). Endemic. Described from Pamir. Type in Leningrad.

10. *A. apicatus* Ovcz. sp. nov. in Addenda p. 744.

Perennial. A glaucous-green plant, loosely tufted or producing solitary culms, with creeping rhizome and sterile shoots, to 30-60 cm tall; culms with loose, brown-colored remains of dead sheaths, erect, glaucous-green, the sheaths of upper leaves somewhat inflated and longer than the blades; leaves sharply scabrous, flat, smooth underneath, to 6 mm broad, attenuate-acuminate; ligule oblong, attenuate at the top, to 3 mm long. Inflorescence spikelike, compact, short-cylindrical or oval-cylindrical, finely hairy, motley grayish-red, 1.5-4 cm long, 8-11 mm broad; spikelets in threes to fives on very short branchlets, up to 4.5-5 mm long, urceolate-oblong, hairy; glumes united in lower 1/4-1/5, acute, with divergent rubescent tips, more or less long-ciliate on the keel and appressed-hairy elsewhere, fimbriate-ciliate on the margins; lemma shorter than the glumes or nearly as long, acute truncate, minutely ciliate on the back and above on the margins, awned from its lower 1/4, awn geniculate, dark purple at the end, slender, exerted 2-3 mm; anthers oblong, to 3 mm long, yellow, with connivent tips. July-August. (Plate X, Figure 16).

Alpine meadows and sparsely stony slopes in the high-mountain zone, up to 3,800 m. - Centr. Asia: Pam. - Al. Endemic. Described from the Altai chain. Type in Leningrad.

NOTE. Annual [sic], edible pasture plant.

11. *A. ventricosus* Pers. Syn. I (1805) 80; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 194. - *A. arundinaceus* Poir. Encycl. VIII (1808) 776; Shmal'g. Fl. II, 603. - *A. nigricans* Horn. Hort. Hafn. I (1813) 68. - *A. ruthenicus* Weinm. Cat. Dorpat. (1810) 10; Griseb. in Ldb. Fl. Ross. IV, 463. - *A. sibiricus* Hort. Vind. ex Roem. et Schult. Syst. II (1817) 271. - Ic.: Rechb. Ic. Fl. Germ. I, tab. 49, fig. 1478 (sub *A. nigricans* Horn.). - Exs.: Pl. Finl. exs., No 446 (sub *A. arundinaceus* Poir.).



Perennial. A tall plant, to 60-80 cm in height, forming loose clumps, often grayish-green, with creeping rhizomes; leaves very scabrous, long, flat, 4-5 (8) mm broad, with smooth, amplexicaul, long sheaths and short or oblong, 1.5-2.5 mm long, attenuate-rounded ligule. Inflorescence spike-like, cylindrical, elongate; spikelets oblong-urceolate, grayish-green; glumes bent sideways, obliquely short-truncate, long-ciliate on the keel, about as long as the lemma; lemma obliquely truncate, obtuse or obtusely pointed, awnless, more rarely with a long, exserted awn. (var. *exserens* Griseb.). May-July.

Occurs on flood lands and on solonets and solonchak meadows, on pebbles, along rivers and streams, bogs, etc. -Almost everywhere in the Soviet Union, from the arctic down to southern regions, most frequently in the steppe zone; absent in the high-mountain zone; extends eastward as far as the Lena-Kolyma and Dauria regions, where it is already of much rarer occurrence. It is recorded as adventive in the Ussuri region. Described from southern Europe.

ECONOMIC IMPORTANCE. An excellent forage grass, particularly suitable for cultivation on wet solonetz soils in arid steppe conditions.

NOTE. Following a detailed study, this species could undoubtedly be divided into a number of geographical strains.

12. *A. sericeus* Alb. in Bull. Herb. Boiss. I (1893) 251; Som et Lev. in A.H.P. XVI (1900) 439. -*A. ponticus* C. Koch ex parte in Linnaea XXI (1848) 382. -Exs.: Herb. Fl. Cauc. No 54.

Perennial. A tall plant, to 50-70 cm in height, forming loose clumps 150 and tufts; rhizome slender, cordlike, somewhat fibrous; culms mostly with several leaves, surrounded at the base with brown-colored remains of the lower, somewhat pubescent sheaths; leaves numerous, smooth at the base, 0.3-0.5 cm broad, broadly folded, acuminate, attenuate; sheaths rather firmly clasping the culm, more rarely the uppermost sheath very slightly inflated; ligule to 1-1.5 mm long, blunt. Inflorescence rather loose, cylindrical, more rarely oval-cylindrical, often dark purple; spikelets oblong-urceolate, with finely pointed, divergent glumes to 5-5.5 mm long; glumes more or less long-silky-ciliate on the back, sometimes ciliate on the lateral nerves and margins, glabrous elsewhere; lemma to 1 mm shorter than the glumes, produced at the summit into a short, slightly recurved mucro; awn attached about the middle, not exserted or slightly exserted (var. *circassicus* Alb.); palea linear-lanceolate, 1-nerved. July-August. (Plate XI, Figure 1).

Alpine and subalpine meadows and mounds. -Caucasus: Ciscauc., Gr. Cauc., West. and East, Transcauc. Gen. Distr.: Turkish Lazistan. Described from Abkhazia, from stony mounds of the town Chedysh. Type in Leningrad.

Explanation to Plate XI

1. *Alopecurus sericeus* Alb. -2, 3. *A. pratensis* L. -4. *A. laxiflorus* Over. -5. *A. seravchanicus* Over. -6. *A. vaginatus* Pall. -7. *A. tiffisiensis* (Wemb.) Grossh. -8. *A. textilis* Boiss. -9. *A. dasyantus* Trautv. -10. *A. glacialis* C. Koch. -Annotations to all drawings: a-glumes, b-lemma, c-ovary with styles, d-anther.

ECONOMIC IMPORTANCE. A good forage plant of mountain pastures. It should be studied with a view to introducing into cultivation.

13. *A. Gerardi* Vill. Delph. 2 (1787) 66; Griseb. in Ldb. Fl. Ross. IV, 460. - *Colobachne Gerardi* Rechb. Ic. Fl. Germ. I, tab. 50, fig. 1480.

Perennial. Rhizome thickened; leaves linear, flat, the upper ones with inflated sheaths. Inflorescence compact, ovoid, hairy; awn short, scarcely exerted, attached about the middle of the lemma.

There is an old record of Koch for the Caucasus (Georgia). Additional confirmation is needed. Described from the mountains of France. Gen. Distr.: Mediterranean, from Pyrenees to Balkans and Asia Minor.

Series 3. *Pratenses* Ovcz. - Spikelets elliptical or ovate-elliptical; tips of glumes connivent or erect. Glumes more or less long-hairy on the keel and sometimes on the nerves, glabrous elsewhere or covered with scattered, appressed, short hairs, especially in lower part.

14. *A. pratensis* L. Sp. pl. (1753) 60; Griseb. in Ldb. Fl. Ross. IV, 462; Shmal'g. Fl. II, 602; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 191. - *A. alpinus* β *glaucus* Kryl. Fl. Altaya (Fl. of Altai) VII (1914) 1580 ex parte.

Perennial. Tall plant, forming loose tufts with a short creeping rhizome and a profusion of leafy sterile shoots; culms to 100-120 cm tall; leaves flat, sharply scabrous, 3-5 mm broad, long; sheaths smooth, appressed, occasionally slightly dilated in uppermost leaf; ligule obtusely truncate, to 1-2 mm long, often lacerate. Inflorescence cylindrical, 3-9 cm long, 6-9 mm broad; spikelets arranged on appressed branches, 3-4 per branch, 151 to 6 mm long; glumes united in lower 1/4-1/5, long-ciliate on the keel, 2-nerved, the nerves slightly hairy below and reaching neither the base nor the summit; anthers yellow, 2.5-3.2 mm long. Beside the typical form, a low-growing form occurs in arctic Europe, with glaucous, strongly thickened inflorescence (var. *alpestris* Wahlbg.). June-July. (Plate XI, Figures 2, 3).

On flood lands and wet meadows, mostly in the forest zone, often forming extensive natural meadow swards along borders of streams. - European part: from Arctic Europe down to Pritchern., Low. Don., Low. Volg. Absent in Crimea. Caucasus: Ciscauc., West. Cauc. In Siberia from Ural to Len. - Kol. and Daur. Farther to the east only as introduced plant (e.g. in Ze. - Bur region, the experimental Pikan field; in Ussur. region in irrigated fields). In Central Asia it occurs in Dzung. - Tarb., Tyan'-Shan and Syr-Dar. submont. Described from Western Europe. Type in London.

ECONOMIC IMPORTANCE. One of the best forage plants introduced into cultivation. Recovers well after grazing; a grazing-resistant plant.

15. *A. laxiflorus* Ovcz. sp. nov. in Addenda p. 744. -

Perennial. A tall plant, 60-100 cm in height, with creeping rhizome; leaves up to 8 mm broad, very scabrous, sheaths long, smooth, somewhat glaucous, tightly enveloping the culm; ligule 3-3.5 mm long, elliptical, lacerate-fimbriate at the apex. Inflorescence spikelike, long, cylindrical, to 9 cm long, silvery-silky-gray, often interrupted below, loose, with long branches bearing numerous, large, 5-7 mm long, ovoid-oblong-elliptical, silky-villous spikelets: glumes united in lower 1/6-1/7 part, acute, with slightly divergent tips, ciliate-hairy on the keel, nerves, and margins; lemma longer than the glumes, elongate, narrow-elliptical; awned from

its lower 1/5-1/7 part, awn geniculate, exerted up to 6 mm; anthers oblong, to 3.5 mm long, with divergent lower ends. June-July. (Plate XI, Figure 4).

Occurs in high-mountain meadows, up to 3,300 m. -Centr. Asia: Pam. -Al. (Zeravshan, Gissar chain). Endemic. Described from the Gissar chain, Khokl Pass, about 2,800 m. November 1933. P.N. Ovchinnikov.

ECONOMIC IMPORTANCE. Undoubtedly belongs among good forage grasses.

16. *A. seravschanicus* Ovcz. sp. nov. in Addenda p. 745.

Perennial. A plant with short-creeping rhizome and long, fibrous roots, with several culms up to 30-45 cm tall, forming loose clumps; leaves scabrous, flat, 3-7 mm broad; sheaths glaucescent, the upper ones inflated, often with reduced blade, smooth; ligule 1.5 (2) mm long, convolute, rounded-obtuse and often fimbriate at the apex, oblong. Inflorescence oval-cylindrical, 3-4.6 cm long, 11-12 mm broad, grayish-silky, with projecting, long, thin awns; spikelets up to 5 mm long, ovate-elliptical, hairy; glumes with non-connivent or slightly divergent tips, united through less than a 1/5 part, with scattered hairs all over the surface, long-ciliate on the keel, obscurely 2-nerved, mostly longer than the lemma; lemma oblong-elliptical, acute, somewhat short-truncate, short-ciliate on the keel above, on the margin, and on the nerves, the flexuous awn attached on the lower 1/5-1/6 and exerted 3.5-4 mm; anthers to 3.5 mm long. July-August. (Plate XI, Figure 5).

Alpine meadows, up to 3,300 m. -Centr. Asia: (Zeravshan). Endemic. Described from Zeravshan (Putkhin Pass). Type in Leningrad.

ECONOMIC IMPORTANCE. An excellent forage plant, growing in considerable concentrations in the subalpine zone. Eaten satisfactorily by all kinds of livestock, especially by cattle and horses.

17. *A. songoricus* (Roshev.) V. Petr. (nomen) Fl. Yakut. I (1930) 147. -*A. pratensis* var. *songoricus* Roshev. ex parte in Fl. Az. Ross. (Fl. As. Russ.), Ser. 1, 2, IV (1924) 213. -*A. alpinus* var. *ventricosus* Kar. et Kir. in Bull. Soc. Nat. Mosc. XIV. (1841) 861. -*A. pratensis* auct. Fl. Turk.

Perennial. Loosely tufted, with a profusion of sterile shoots; culms 30-100 cm tall, with flat, very scabrous leaves to 2.5-5(6) mm broad; sheaths, like the plant as a whole, mostly glaucous-green, smooth, somewhat inflated in upper leaves, mostly longer than the blades; ligule 1.5 (-2) mm long, oblong, rounded, sparingly short-ciliate. Inflorescence spike-like, compact, oblong- or short-cylindrical, silky-purple, with rather long branches, each bearing numerous spikelets; spikelets 4-4.5 mm long, elliptical, with straight, more rarely divergent tips; glumes often dark-purple-tinged, united through more than 1/4 of their length, long-hairy on the keel, appressed-hairy on the nerves, elsewhere glabrescent or with scattered short hairs; lemma very slightly longer than the glumes, somewhat truncate at the summit and prolonged into a sharp point, minutely ciliate on the back; the thin, flexuous awn, attached slightly below the middle of the lemma, exerted 2-3 mm; anthers narrowly oblong, 2-3 mm long. June-July. (Plate X, Figure 13).

Occurs in alpine and subalpine meadows, more rarely descending into valley meadows below. -Centr. Asia: Dzung. -Tarb. and Tyan'-Shan, up to 2,700 m. Endemic. Described from the Dzung. -Tarb. region. Type in Leningrad.

ECONOMIC IMPORTANCE. Deserves introduction into cultivation, as it equals apparently meadow foxtail (*Alopecurus pratensis* L.) as regards fodder quality. This species is distinguished by its later flowering.

- 153 **Series Alpinae** Ovcz. - Perennial plants, forming loose tufts, mostly with creeping rhizomes. Spikelets rather broadly elliptical, hairy, small, mostly 3-4.5 mm long. Awn mostly short, more rarely to 3-4 mm long, or lacking.

18. *A. glaucus* Less. in *Linnaea* IX (1834) 206; Griseb. in *Ldb. Fl. Ross.* IV, 462. - *A. pratensis* var. *songoricus* Roshev. (ex parte) in *Fl. Az. Ross.* (Fl. As. Russ.), Ser. 1, 2, IV (1924) 213. - *A. glaucus* Hult. ex parte in *Fl. of Kamtsch.*, I (1927) 92, non Less. - *A. glaucus* V. Petr. ex parte *Fl. Yakut.* I (1930) 146, non Less. - *A. altaicus* V. Petr. *Fl. Yakut.* I (1930) 146.

Perennial. A plant with short, creeping rhizomes, with several culms to 60 cm tall; culms erect, with 5-6 internodes, glabrous, often glaucous-green; leaves flat, 4-5 mm broad, long, very scabrous on both sides, the uppermost leaf often exceeding the inflorescence; sheaths shorter than the internodes, smooth, glaucous, very slightly inflated or not inflated; ligule entire, rather rounded at the apex, 1.5-2 mm long, often convolute. Inflorescence 2-3 cm long, 8-10 mm broad, oblong-elliptical, rarely longer; glumes united in lower 1/4, with 2 dark green nerves, hairy all over, though mainly on the nerves, and especially on the keel, acuminate, with approximate but not connivent tips; lemma very slightly longer than the glumes, glabrous, whitish-green, with a cluster of short hairs on the back, just below the tip; awn attached on the lower 1/3 of the lemma, straight or somewhat geniculate, to 3-4 mm long, exserted, 1 1/2 times as long as the spikelet. July. (Plate X, Figure 6).

High-mountain and alpine meadows. - European part: South. Ural (Taganai, Iremel', Il'menskie Mountains); West. Siberia: Alt., Centr. Asia: Tarb.; East. Siberia: Ang - Sayan (Tunkinskie Belki [Ranges] - Komarov). Endemic. Described from Mount Taganai. Type in Leningrad.

ECONOMIC IMPORTANCE. Good forage plants of natural mountain pastures.

19. *A. pseudobrachystachyus* Ovcz. sp. nov. in *Addenda* p. 745. *A. brachystachyus* Drobov (non M. B.) Yakutsk. Maisk. Tract (compl. vers.) (1914) 245. - *A. glaucus* V. Petr. *Fl. Yakut.* I (1930) 146, non Lessing.

- Perennial. Not tufted; culms solitary, to 90-100 cm tall; leaves to 20 cm long and 3-4 mm broad, flat, very scabrous, often folded; sheaths amplexicaul, shorter than the blades, smooth; ligule of the uppermost leaf to 3 mm long, rounded. Inflorescence short-cylindrical, spikelike, purple-grayish-green, to 4.5 cm long, 7-8 mm broad; spikelets 2-3 per branch 4-4.5 mm long, oblong-ovate, compactly clustered, densely covered with fine hairs grayish-green or glaucous-gray, with characteristic, dark-purple, sharp tips; glumes covered with spreading hairs, united in lower 1/4; lemma as long as the glumes, rarely very slightly shorter, pointed, glabrous or faintly hairy above; awn attached on lower 1/3 or higher up, slightly flexuous, once-geniculate, exserted 1.5-3 mm; anthers 1.5-2.3 mm long, oblong. June-July. (Plate X, Figure 7).

Grassy mounds, swampy meadows, meadow bogs, and coppices. - East Siberia: Len. - Kol., Far East: Ze. - Bur. Endemic. Described from the river Zeya (Ulunga experimental field). Type in Leningrad.

20. *A. tenuis* Kom. in Fedde, Repert. sp. nov. XIII (1914) 85. -*A. glaucus* Hult. Fl. of Kamtch. I (1927) 92 ex parte, non Less.

Perennial. A tall plant, to 70 cm in height, somewhat glaucous-green, with a creeping, slender rhizome; leaves long, 1.5-2 (3) mm broad, sheaths practically non-inflated. Inflorescence short-oval or ovoid, 0.8-1.2 cm long, compact, mostly silky grayish-purple; spikelets broadly elliptical, 3.5-4 mm long, pointed; glumes united in lower 1/4, covered with scattered hairs. Lemma shorter than the glumes or as long, acuminate-tapering or slightly truncate, awn attached on lower 1/3, short, straight, exserted to 1-1.5 (2) mm. July-August.

In the forest zone, in meadows, among birch woods and coppices. -Far East: Kamch. Endemic. Described from the shores of Kronotskoe Lake. Type in Leningrad.

ECONOMIC IMPORTANCE. Undoubtedly a forage plant, but the rather coarse culms and the scabrous, narrow, and often setaceous-folded leaves detract from its value.

21. *A. Roshevitzianus* Ovcz. sp. nov. in Addenda p. 745. -*A. alpinus* var. *elatus* Roshev. in Fl. Aziat. Ros. (Fl. As. Russ.) Ser. I, 2, IV (1924) 221, non Kom.

Perennial. A plant to 60 cm tall, or taller, with a short-creeping rhizome, differing from *A. tenuis* Kom. in broader (to 3-5 mm), long leaves, more slender, weak culms, oblong, elongated ligule (to 4 mm long), elongated loose inflorescence (to 4 cm long), tinged with silky greenish-gray or silky grayish-purple, and narrowly elliptical spikelets with a long (to 3-3.5-4 mm), straight awn; lemma obtuse, as long as the acuminate, erect or slightly divergent glumes; anthers narrowly oblong, to 3 mm long. Differs from *A. borealis* in slightly inflated sheaths and long, narrower leaves. July. (Plate X, Figure 12).

Grassy slopes and meadows, and marsh and meadow-bog sites, -Arctic: Arct. Siberia eastward to the Yenisei, not reaching as far as Anadyr' and Chukot regions; east Siberia: Northern half of Len.-Kol. region. Endemic. Described from Yakutia (Kalyma region, slopes descending toward Kolyma River). Type in Leningrad.

155 **ECONOMIC IMPORTANCE.** Apparently a quite satisfactory forage plant.

22. *A. alpinus* Sm. Fl. Brit. III (1804) 1386; Griseb. in Ldb. Fl. Ross. IV, 461; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 193. -*l.c.*: Trin. sp. Gram. icon. (182) t. 38.

Perennial. A low-growing arctic plant, mostly 13-15 in height, more rarely taller, mostly forming loose tufts with sterile shoots at base; culms with 2-3 internodes; lower leaves narrow, upper ones broader, 3-4 mm, with slightly dilated sheaths. Inflorescence spikelike, densely hairy, grayish, often purplish-gray, mostly ovoid or short-cylindrical, 1-2 cm long, 6-9 mm broad, with mostly densely imbricate spikelets; spikelets 3.5-4.5 mm long, ovoid or ovoid-urceolate, often dark purple; glumes often slightly divergent, mostly densely hairy, the hairs long, especially on the keel, often terminating in a small, slightly recurved tooth, united in lower 1/4-1/3, as long as the lemma or shorter; lemma glabrous, pointed, or faintly hairy at the summit on the margin and on the keel; awn attached on lower 1/3 or nearly at the middle, straight, not exserted or exserted to 1-1.5 mm, more rarely lacking; anthers 1.5-2 mm long. July. (Plate X, Figure 10).

Sandy meadows and river banks, slopes and stone drifts. -Arctic: almost everywhere in the Arctic zone of Europe, Arct. Siberia as far as Taimyr Peninsula. Gen. Distr.: Scotland, Arct. Europe (Spitsbergen).

ECONOMIC IMPORTANCE. A forage plant of arctic pastures. Deserves attention in connection with the organization of a fodder base in the north.

NOTE. Found in fossilized state in post-Pliocene, in mammoth's food. Len.-Kol. (Berezovka River, Yakutia).

23. *A. borealis* Trin. Fund. Agrost. (1820) 58; Schult. Mantissa (1824) 154. -*A. alpinus* β *borealis* Griseb. in Ldb. Fl. Ross. IV (1853) 461.

Perennial. A loose tufted plant, with creeping rhizomes, to 35 cm tall, often glaucous-green. Culms rather stout, often with somewhat inflated, long sheaths, overlapping below except for the lowest leaves, longer than the 4-5 mm broad, narrowly lanceolate blades. Inflorescence spikelike, whitish or grayish-green, more rarely grayish-purple, short-cylindrical, or ovoid, compact, mostly densely hairy, to 2.2 cm long, to 1 cm broad, with developed branches; spikelets 4-5 mm long, densely hairy, subovate-elliptical; glumes with pointed, straight or divergent tips, longer than the lemma; lemma truncate-obtuse, short-ciliate on the back and at the summit, minutely hairy on the sides in upper part, awn attached on lower 1/4, 155 straight, exerted 1.2-2.5 (4) mm; anthers 1.5-2 mm, oblong. July-August. (Plate X, Figure 11).

Pebble drifts in river valleys, slopes, etc. -Arctic: Arct. Siberia., Anad., Chuk.; East Siberia: Northern part of Len.-Kol.: Far East: Kamch. Gen. Distr.: Northeastern part of North America. Described from Chukot Coast, Sv. Pavla [St. Paul's] Island. Type in Leningrad.

24. *A. Stejnegeri* Vasey Proc. U.S. Nat. Mus. (1887) 153.

Perennial. A plant 10-30 (-50) cm tall, producing solitary culms; leaves to 6 mm broad, very scabrous on one side; blades of all leaves often, and that of the uppermost leaf always, shorter than the sheath, set at an acute angle, often of ununiform width; ligule of the uppermost leaf 2-2.5 (4-6) mm long, obtuse or rounded. Inflorescence spikelike, broadly ovoid, sometimes subglobose, 1.5-2.5 cm long, densely hairy, whitish-yellow-gray in color; young inflorescences are often enveloped from below by the inflated sheath of lowest [sic] leaf whose short blade exceeds the entire inflorescence. Spikelets distinctly pedicellate, to 5.5 mm long, densely white-yellowish-hairy; glumes to 5.5 mm long, united in lower 1/4, densely covered with long hairs, rounded at the summit and terminating in a small point, longer than the lemma; lemma to 4.5 mm long, obtuse-rounded or slightly emarginate, 6-nerved above, with hairs on the back above and on the margins; awn attached on lower 1/3, to 6 mm long, weakly once- or twice-geniculate, light-colored or purple, barbed at the tip and at the bends; awn often geniculate recurved; anthers to 2.5 mm long. July-August. (Plate X, Figure 9).

Meadows in the alpine zone and river banks. -Arctic: Anad. and Chuk.; Far East: Kamchatka, Commander Islands (Mednyi Island). Gen. Distr.: North America. Described from North America. Type in Washington.

Series *Annuae* Ovcz. -Annual, more rarely biennial plants, often with ascending or even prostrate, geniculate culms.

25. *A. myosuroides* Huds. Fl. Angl., ed. I (1762) 23. -*A. agrostis* L. Sp. pl., ed. 2 (1762) 89; Griseb. in Ldb. Fl. Ross. IV, 465; Shmal'g. Fl. II, 603. -*l.*: Trin. Sp. Gram. I (1828) tab. 37.

Perennial. 10-40 cm tall, forming small tufts with numerous, rarely solitary culms and thin, fibrous roots; culms geniculate, ascending or erect; leaves flat, long-acuminate, 4-6 cm [sic] broad; sheaths smooth; ligule 2 (4) mm long, rounded at the apex. Inflorescence narrowly cylindrical, slender, supple, tapering at both ends, to 6-7 cm long; spikelets 1-flowered, 4-5 mm long; glumes glabrous or minutely hairy at base, acute, with 2-3 green, indistinct nerves; lemma glabrous, oblong-elliptical, to 157 4.5 mm long, pointed, the geniculate awn exerted to 5 mm, attached on the lower 1/4-1/5; anthers to 3 mm long. May-June. (Plate X, Figure 5).

Meadows, brooks, parks, borders of irrigation ditches, sometimes as a weed. -European part: singly in Mid. Dnep., Upp. -Volg., Volg.-Don., Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: all regions except Great Caucasus and Western Transcauc.; Centr. Asia: Amu-Dar., Syr-Dar. Gen. Distr.: all Europe except the north, Asia Min., Iran. Described from England. Type in London.

26. *A. longiaristatus* Maxim. Prim. Fl. Amur. (1859) 327; Rozhev. in Fl. Az. Ross. (Fl. As. Russ.), Ser. 1, 2., IV (1924) 207, -*A. longearistatus* Rgl. in Mem. Acad. Sci. Petersb., ser. 7, IV (1861) No 4.

Annual. 15-35 cm tall; culms geniculate-ascending, more rarely erect; sheaths smooth, usually shorter than the leaf blades, rather loosely enveloping the culms, the sheath of the uppermost leaf inflated and often enveloping the inflorescence; ligule to 4 mm long, pointed. Inflorescence more or less laterally compressed, to 4-7 cm long, cylindrical; inflorescence branches rather long, each bearing several spikelets; spikelets ca. 2.5-3 mm long; glumes ciliate on the keel and lateral nerves, hyaline on the margins; lemma acuminate-lanceolate, 3-nerved, the geniculate awn attached on its lower 1/3, 2-3 times as long as the spikelet, very scabrous in upper part. June-July. (Plate X, Figure 4).

Sandy river banks. -Far East: Ze.-Bur., Ussur. Gen. Distr.: Manchuria. Described from Amur. Type in Leningrad.

27. *A. geniculatus* L. Sp. pl. (1753) 60; Griseb. in Ldb. Fl. Ross. IV, 464; Shmal'g. Fl. II, 603; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 197, -lc.; Trin. Sp. gram. icon. I (1828) tab. 42. -Exs.: Plant. Finl. exs.: Mus. Helsing., No 450.

Annual. A loosely tufted plant, with numerous, geniculately ascending culms, profusely leafy, especially at the base; culms 20-30 (40) cm long; leaves more or less scabrous on the upper surface, 2-4 mm broad, the upper ones often shorter than the smooth, amplexicaul, occasionally somewhat inflated sheaths; ligule 2-4 mm long, oblong, convolute-ampexicaul, attenuate above, obtuse. Inflorescence spikelike, cylindrical, 3-5 cm long, 0.4-0.6 mm broad; spikelets on appressed branches, 2-4 per branch, 2.5-3 mm long, oblong-elliptical, slopingly truncate, long-awned; glumes united in lower 1/5-1/4, obtuse, broadly hyaline, with the hyaline border marked out above by a white fringe, ciliate on the back and nerves, about as long as the lemma, often purple-tinged above, with parallel tips; lemma obtuse, awned from below the middle or close to the base, the awn geniculate, exerted to 2 mm and recurved, green or purple; anthers oblong, purple or brown-yellow with purple fringe, to 2 mm long. June-August. (Plate X, Figure 2).

Wet places near brooks, river banks, roadsides, ubiquitous in the forest 158 and forest-steppe zones. -European part: from Arct. Eur to Prichern.,

Low. Don., Zavolzh.; West. Siberia: very rarely in Ob. region and Upp. Tob. Gen. Distr.: nearly all Europe, Iran, Jap.-Chin., N. Am. Described from Europe. Type in London.

28. *A. amurensis* Kom. in Bull. Jarg. Bot. XVI (1916) 151. -*A. fulvus* var. *amurensis* Kom. A.H.P. XX (1901) 272; Fl. Az. Ross. (Fl. As. Russ.), Ser. 1, 2, IV (1924) 209. -*A. fulvus* auct. fl. Sibir. orient. (non Sm.). -*A. geniculatus* var. *amurensis* (Kom.) Roshev. in Prilozh. Izv. Bot. sada (Suppl. Bull. Bot. Gard.), XIV (1914) 54. -Exs.: HFR No 2698.

Annual. Small tufts, with thin, fibrous roots; culms 15-30 (50) cm tall, green or glaucous-green, weak, geniculate, ascending or erect; leaves flat, 7-10 cm long, acuminate, the lower leaves 1-2 mm broad, the upper ones 3-4 mm broad, scabrous on the upper surface and on the margins due to minute, short, setiform hairs-sheaths smooth, rather loosely adherent, the upper ones somewhat inflated; ligule of the uppermost leaf oblong, to 5 mm long, acuminate-attenuate. Inflorescence 2-8 cm long, with long, appressed branches; spikelets elliptical or somewhat urceolate-elliptical, 2.5-3 mm long, in clusters of 3-6; glumes acuminate or obtuse, with parallel or slightly divergent tips, ciliate on the keel and faintly hairy on the lateral nerves; lemma glabrous, as long as the glumes or somewhat longer, obtuse, the straight or somewhat flexuous, slender awn attached on the lower 1/3 and exserted 1.5-2 mm; anthers short, orange, 0.7-1 mm long. May-July. (Plate X, Figure 3).

Clay banks, stone drifts, river banks and meadows. -East. Siberia: South. half of Len.-Kol., Daur.; Far East: Ze.-Bur., Ussur., Ud. and rarely Okhot. Gen. Distr.: Manchuria. Described from Amur. Type in Leningrad.

29. *A. aequalis* Sobol. Fl. Petropol. -*A. fulvus* Sm. in Smith and Sowerby, Engl. Bot. XXI (1805) tab. 1467; Griseb. in Ldb. Fl. Ross. IV, 464; Shmal'g. Fl. II, 604; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 195. -Exs.: Hayeck, Fl. Stir. 19 et 20 Lief. No 912.

Annual. Small plant with geniculate, spreading or ascending, rarely erect, culms 20-45 cm long, forming loose clumps; leaves 1-3 mm broad, acuminate, smooth on the upper surface, scaberrulous underneath; ligule of the uppermost leaf 3-4 mm long, oblong, more or less pointed. Inflorescence narrow, spikelike, 3-4 cm long, 3-3.5 mm broad; spikelets 2-2.5 mm long, borne on branches appressed to the rachis, in clusters of 2 to 11; glumes broadly hyaline, obtuse or rounded, with 2 green nerves, ciliate on the margins and especially on the keel; lemma obtuse, glabrous, as long as the glumes, the short, slender, straight awn attached at the middle or below it, not exserted or exserted 0.5-0.8 mm; anthers round or round-oval, mostly orange, to 0.8-1 mm long. June-August. (Plate X, Figure 1).

159 Wet places, boggy meadows, silty banks of rivers and brooks, tussocky grass-covered marshes, borders of canals, etc. Everywhere in European and Asian parts of the U. S. S. R., mainly in the forest zone, becoming much scarcer southward. In Siberia reaches the Dauria and Len.-Kol. regions: Far East: Kamchatka, Sakhalin, extremely rare on the Sea of Okhotsk coast. Gen. Distr.: nearly all Europe, Asia Minor. Described from the environs of Leningrad. Type in Leningrad.

ECONOMIC IMPORTANCE. Excellent fodder plant, but because of its low growth and the spreading or ascending culms it gives a small amount of herbage, and hence its agricultural use is confined to pasturage.

A. geniculatus L. x *ventricosus* Pers. var. *exserens* Mars. (*A. Marssoni* Hausskn. ms.) ex Asch. et Gr. Synops. II, 1 (1899) 140. - Exs.: HFR No 2700.

Growth intermediate between the parents, to 80 cm tall. Distinguished from *A. geniculatus* by the presence of underground shoots, stonger growth, and the shape of glume which resembles that of *A. ventricosus*. It differs from *A. ventricosus* in weaker growth, smaller size of inflorescence, glumes united at base, and the long, geniculate awn attached at the base of the lemma—all these being characters associated with *A. geniculatus*. The hybrid origin of this species is indicated by abortive, mostly wrinkled pollen and the occurrence of the plant in large numbers among the parents. May-July.

In wet, sometimes solonchets-like places. -European part: Volg. -Don. Gen. Distr.: Scand.; Centr. Eur. Described from Finland.

Genus. 110. MIBORA* ADANS.

Adans. Fam. II (1763) 495.

Inflorescence spike-like or racemose, with spikelets borne on very short pedicels. Spikelets very small, 1-flowered. Glumes subequal, much longer than the lemmas. Lemmas obtuse, awnless, hairy. Stamens 3; stigmas filiform, finely plumose.

1. *M. minima* (L.) Desv. Fl. Anjou (1827) 48. - *Agrostis minima* L. Sp. pl. (1753) 63. - *Mibora verna* P.B. Agrost. (1812) 167; Shmal'g. Fl. II, 604. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 26, fig. 1405. - Exs.: Kneucker, Gram. exs., No 12.

Annual or biennial. Densely tufted; culms 3-9 (-18) cm tall, slender, surrounded at the base by sheaths of radical leaves; leaves narrowly linear, setaceous-folded, 1-6 cm long; ligule ca. 1 mm long, broad, amplexicaul. Inflorescence narrowly linear, to 1.5 cm long, with a serpentine rachis; spikelets 0.5-1 mm long, borne on pedicels 1.5 long, narrowly lanceolate, obtuse; glumes dentate at the summit, more or less purple; lemma and palea of equal length, toothed at the summit; lemma 5-nerved, enveloping the palea. April-May. (Plate XII, Figure 1, a).

Sands. -European part: Mid. Dnep. (western boundary). Gen. Distr.: Centr. Eur., Atl. Eur., Medit. Described from France. Type in London.

Genus 111. COLEANTHUS**SEIDL.

Seidl. in Roem. et Schult. Syn. II (1817) 11 et 276.

Inflorescence a raceme composed of distinct groups of pedicellate spikelets, aggregate in clusters. Spikelets small, 1-flowered, perfect. Glumes lacking. Lemmas hyaline, unequal. Lodicules lacking. Stamens 2. Pistils with short-plumose stigmas. Caryopsis cylindrical-ovoid, longer than the lemmas and falling off together with them.

* Like most names given by Adanson, it does not mean anything.

** From Greek koleos=sheath, and anthos=flower.

1. *C. subtilis* (Tratt.) Seidl. in Roem. et Schult. Syst. II (1817) 276; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 197. - *Schmidtia subtilis* Tratt. Fl. Oesterr. Kaiserth. I (1816) 12 cum tab. 10. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 48, fig. 1468 - Exs.: HFR No 2534; Kneucker, Gram. exs., No 494.

Annual. Branching at the base and forming small clumps; culms 2-7 cm tall, glabrous, leafy; sheaths of upper leaves strongly inflated, enveloping the inflorescence; leaves narrowly linear, folded, falcately bent. Inflorescence with a geniculate, weakly branching axis, on which spikelets are aggregate of 10-20 in subspherical clusters 2-4 mm across each containing 10-20 spikelets; spikelets up to 1 mm long, borne on hispid pedicels; lemmas ciliate on nerves. July-October. (Plate XII, Figure 2, a).

Mud flats and silty borders of streams and lakes. - European part: Lad. - Il'm. (Volkhov River, Il'men' Lake, coll. by E. Selivanov); west. Siberia: Ob' region, (Surgut County - on the Vakh, B. Gorodkov and Narym, Parabel' River valley, N. Kuznetsov, B. Klopotov); Far East: Uda. (Amur River, R. Maak, 1855; Amur River, between the town Marijnsk and Kitsi village, Maksimovich, 1856). Gen. Distr.: Scand. (southern Norway), centr. Europe Atl. Eur., N. Am. Described from Austria.

NOTE. In western Europe this plant appears almost exclusively on the exposed bottom of lakes and reservoirs which are periodically drained or 163 dry up for some reason. It appears suddenly in large quantity, and then disappears rapidly without leaving a trace, sometimes for many years.

Nothing is known concerning the distribution and growing conditions of this interesting plant in the U. S. S. R. except for the above-mentioned observations made by collectors. It is quite probable that here also the plant appears only periodically in years favorable for its growth. This may partly account for the scarcity of information and the disjointedness of sites on which it was found.

Genus 112. *SPOROBOLUS** R. BR.

R. Br. Prodr. (1810) 169.

Inflorescence (in our species) a narrow, spikelike, contracted panicle, with spirally arranged branches. Spikelets small, glabrous, awnless. Glumes shorter than the lemmas. Lemma and palea equal in length, palea bilobed. Pericarp not united with the seed coat, forming an utricle (Schlauchfrucht). Ripening seeds are released from the pericarp, but do not fall, being retained for a time at the summit of the flowering bracts.

1. *S. indicus* (L.) R. Br. Prodr. (1810) 170. - *Agrostis indica* L. Sp. pl. (1753) 63. - *Vilfa indica* Trin. ex Steud. Nomencl. ed. 2, II (1841) 767.

Annual. Densely tufted; culms 40-60 (90) cm tall, erect, glabrous, leafy; leaves linear, long-acuminate, to 50 cm long and 6 mm broad, more or less involute; ligule ciliate. Inflorescence 10-25 cm long and 5-8 mm broad, with appressed branches to 2 cm long, rarely a rather loose inflorescence; spikelets ca. 2 mm long, narrowly lanceolate, light green, short-

* From Greek *spora*=seed, and *bolos*=throwing, i. e. scattering seeds.

pediceled; glumes whitish, hyaline, $1/2-1/3$ as long as the lemmas; lemma pointed, obscurely nerved. (Plate XII, Figure 3, a).

A weed. -Caucasus: Western Transcauc. Asia, (Chakva, roadside, 2 November 1929. A. Makashvili). Gen. Distr.: in all tropical countries. Described from India. Type in London.

Genus 113. POLYPOGON* DESF.

Desf. Fl. Atl. I (1798) 66.

Inflorescence dense, with short branches bearing numerous spikelets, more or less distinctly lobed, oblong, ovoid, or cylindrical. Spikelets 1-flowered, perfect, small, laterally compressed, short-pediceled. Glumes equal, hyaline, keeled, awned. Lemma usually much shorter than the glumes, hyaline, keeled. Palea 2-nerved. Lodicules 2, naked. Stamens 1-3. Pistils short, with plumose stamens. Caryopsis free.

- 164 1. Awn of the glumes shorter or only slightly longer than the spikelet 1. *P. demissum* Steud.
 + Awn of the glumes ca. 3 times as long as the spikelet 2.
 2. Glumes hispid on the back in lower part, awned from below the slightly bifid tip 2. *P. monspeliensis* (L.) Desf.
 + Glumes prickly on the back in lower part, awned from below the deeply bilobed tip; lemma awnless 3. *P. maritimus* Willd.

1. *P. demissus* Steud. Syn. Pl. gram. (1855), 422. -Polypogon littoralis Rgl. in A. H. P. VII (1880) 643 non Sm.

Annual. Tufted; culms 15-70 (-100) cm tall, ascending, glabrous, rather leafy; leaves linear-lanceolate or linear, to 1 cm broad, flat, rather prominently scabrous; ligule to 1 cm long. Inflorescence 3-15 cm long and to 3 cm broad, dense, oblong or subcylindrical, lobed, often interrupted, with branches 2-5 cm long; spikelets ca. 2 mm long; glumes narrowly lanceolate, hirtellous, ciliate on the keel, the awn attached just below the summit and as long as its glume; lemma and palea ca. 1 mm long, glabrous; lemma with awn ca. 2 mm long; palea awnless, 2-nerved. May-June. (Plate XII, Figure 4).

Solonchaks, -Caucasus: East. Transcauc. (Kubinskii Raion, Atachai); Centr. Asia: Kara-Kum, Mountainous Turkmenia, Amu-Dar., Syr-Dar. Pam. -Al., Tyan'-Shan. Gen. Distr.: Iran, Ind., -Him., Jap. -Chin. Described from Japan.

ECONOMIC IMPORTANCE. Readily eaten by livestock, but usually occurs in small quantity.

2. *P. monspeliensis* (L.) Desf. Fl. Atl. I (1800) 67. -Griseb. in Ldb. Fl. Ross. IV, 443; Shmal'g. Fl. II, 604; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 200. -Alopecurus monspeliensis L. Sp. pl. (1753) 61. -Jc., Rchb. Ic. Fl. Germ. I, tab. 31, fig. 1416. -Exs.: HFR No 1447 et 1448.

Annual. Strongly branching at the base; culms 5-60 cm tall, ascending, rather smooth; leaves linear-lanceolate, to 8 mm broad, glabrous, scabrous; ligule to 8 mm long. Panicle dense, spike-like, oblong, 1-10 cm long and 0.5-3 cm broad, whitish-green; spikelets ca. 2 mm long; glumes

* From polys = much, and pogon = beard.



hirtellous, ciliate on the keel, short-bifid at the summit, with awn to 7 mm long; lemma ca. 1 mm long, with awn to 2 mm long, more rarely awnless. May-July. (Table XII, Figure 5).

Wet solonchets meadows; often a weed. -European part: Mid. Dnep., (Volyn), Crimea (?); Caucasus: all regions; Centr. Asia: Aral.-Casp., Pribalkh., Kara-Kum., Upp. Turkm., Amu-Dar., Syr-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: Atl. Eur., Medit., Balk.-As. Min., Arm.-Kurd., Iran, Ind.-Him., Jap.-Chin. Described from France. Type in London.

165 ECONOMIC IMPORTANCE. Readily eaten by livestock; but, being rather scarce, it plays an insignificant role as a forage plant.

3. *P. maritimus* Willd. in Neue Schr. Ges. Nat. Fr. Berl. III (1801) 442, 443; Griseb. in Ldb. Fl. Ross. IV, 443; Shmal'g. Fl. II, 605; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 199. -*Polypogon tataricus* Fisch. Cat. Hort. Gorenk., ed. 2 (1812) 3. -Exs.: Kneucker, Gram. exs., No 684.

Annual. Plant branching at the base; culms 3-40 cm tall, slender, glabrous, more or less smooth, leafy; leaves linear or long-lanceolate, to 3 mm broad, glabrous, more or less scabrous; ligule to 6 mm long. Inflorescence whitish-green, slightly lobed, 0.5-5 cm long and to 1.5 cm broad. Spikelets ca. 2.5 mm long, readily falling off; glumes linear-oblong, hispidulous, with ciliate prickles on the keel, pubescent, deeply bifid, and covered with prickles at the summit, the awn to 8 mm long; lemma ca. 1 mm long, awnless. May-July. (Plate XII, Figure 6, a).

Solonchets meadows and sands. -European part: Low. Volg.; Caucasus: Dag., East. Transcauc. (Sara Island); West. Siberia: Irt.; Centr. Asia: Aral.-Casp., Pribalkh., Upp. Turkm., Syr-Dar., Tyan'-Shan. Gen. Distr.: Atl. Eur., Medit., Balk.-As. Min., Iran, Dzung.-Kashg. Described from France. Type in Berlin.

ECONOMIC IMPORTANCE. Readily eaten by livestock, but it occurs rather rarely, and hence it is of no great economic importance.

Genus 114. LIMNAS* TRIN.

Trin. Fund. Agron. (1820) 116, tab. VI.

Inflorescence a simple, narrow panicle, with short lateral branches. Spikelets 1-flowered, perfect, borne on articulate pedicels. Glumes coriaceous, prominently 3-nerved, awnless. Lemma coriaceous, with distinct nerves and a geniculate awn attached slightly below the middle of its back. Palea awnless, 2-nerved. Lodicules 2. Stamens 2. Pistils united in lower part, with plumose stigmas. Caryopsis free.

* From Greek limnas=bog.

Explanation to Plate XII

1. *Mibora minima* (L.) Desv., a) glumes. -2. *Coleanthus subtilis* (Tratt.) Seidl., a) spikelet. -3. *Sporobolus indicus* (L.) R. Br., a) spikelet. -4. *Polypogon demissus* Steud.: spikelet. -5. *P. monspeliensis* (L.) Desf., spikelet. -6. *P. maritimus* Willd., spikelet, a) inflorescence. -7. *Limnas Veresczagini* Kryl. et Schischk. Inflorescence: a) spikelet. -8. *Arctagrostis latifolia* (R. Br.) Griseb., inflorescence and spikelet. -9. *A. arundinacea* (Trin.) Beal.: inflorescence, a) spikelet. -10. *Cinna latifolia* (Trev.) Griseb. inflorescence, a) spikelet. -11. *Gaznacea* (Trin.) Beal.: inflorescence, a) spikelet. -12. *Pappagrostis pappophorea* (Hack.) Roshev., a) spikelet, b) lemma.

1. Leaves narrow, 1-1.5 mm broad, setaceous-involute; inflorescence few-flowered; spikelets 3.4 mm long; glumes minutely ciliate on the keel. 1. *L. Stelleri* Trin.
 - + Leaves 2.5-4 mm broad, flat; inflorescence many-flowered, dense; spikelets 4-5 mm long; glumes long-ciliate on the keel 2. *L. Vereschagini* Kryl. et Schischk.
1. *L. Stelleri* Trin. Fund. Agrost. (1820) 116, tab. VI; Griseb. in Ldb. Fl. Ross. IV 409. -Exs.: HFR No 2706.
- 156 Perennial. Tufted, with creeping rhizomes and stolons; culms 30-60 cm tall, slender, glabrous; radical leaves narrow, ca. 1-1.5 mm broad, long, setaceous-involute, scabrous; culm leaves very short, 3-4 mm long and 1.5-2 mm broad, whitish-green or purplish; glumes scaphoid, scabrous-pubescent, minutely ciliate on the nerves; lemma scabrous above, with awn twice its length. May-July.
- River banks and riverside forests. -East Siberia: Yenis., Len. -Kol., Ang. -Sayan; Far East: Okhot. Endemic. Described from the Okhotsk-Yakutsk highway. Type in Leningrad.
2. *L. Vereschagini* Kryl. et Schischk. in Animad. System. ex Herb. Univers. Tomsk. No 4 (1927); Kryl. Fl. Zap. Sib. (Fl. West. Sib.) 11 (1928) 200. -*Limnas Stelleri* var. *Vereschagini* Kryl. in Sched. Herb. Tomsk.
- Perennial. Tufted, with short creeping rhizomes; culms 20-50 cm tall, robust, 1-1.5 mm thick, glabrous; leaves 2.5-4 mm broad, narrowly linear, flat or partly involute, the nerves scabrous on the upper side; ligule 2-3 mm long. Inflorescence a narrow, contracted, fairly dense panicle, 4-6 cm long and 7-12 mm broad; spikelets oblong-ovoid, 4-5 mm long; glumes long-lanceolate, long-ciliate on the keel, glabrescent elsewhere; lemma puberulent in upper part, with awn 6-8 mm long. June-July. (Plate XII, Figure 7, a).
- Alpine meadows and mountain slopes. -West. Siberia: Alt. (Naryn Range). Endemic. Described from Altai. Type in Tomsk.

Genus 115. ARCTAGROSTIS* GRISEB.

Griseb. in Ldb. Fl. Ross. IV (1853) 434.

Inflorescence a more or less contracted panicle, with short, rarely long, branches. Spikelets 1-flowered, perfect, short-pedicelated, sometimes with an extension of rachilla beyond the floret. Glumes coriaceous, pointed, unequal, awnless. Lemma and palea longer than the glumes; lemma more or less serrate at the summit, rarely entire, with a distinct dorsal nerve. Lodicules 2, small. Stamens 2-3. Pistil short, with plumose stigmas. Caryopsis ovoid, free.

1. Low-growing, arctic plant, 30-35 cm in height, forming rather compact tufts; panicle interrupted, with short lateral branches 1. *A. festuacea* V. Petr.

* From Greek *arctos*=bear, as well as *arctis*, and *agrostis*=a name used by Homer for some fodder grass.

- + Plant not forming compact tufts. Panicle not markedly interrupted. . 2.
 2. Plants large, 1-1.5 m tall 3.
 167 + Plants rarely attaining 0.5 m in height 2. *A. latifolia* (R. Br.) Griseb.
 3. Panicle to 30 cm long, somewhat contracted, with branches to 12 cm long; spikelets ca. 4 mm long; lemma always with very distinct lateral nerves; the entire plant resembling fowl bluegrass [*Poa palustris*] 4. *A. ursorum* Kom.
 + Panicle to 20 cm long, with branches rarely exceeding 7 cm in length. lemma with almost indiscernible lateral nerves 3. *A. arundinacea* (Trin.) Beal.

1. *A. festucacea* V. Petr. Fl. Jakut. I (1930) 155.

Perennial. Densely tufted; rhizomes short; culms numerous, 25-35 cm tall, glabrous, smooth, surrounded at the base by numerous sheaths of old leaves and by sterile shoots; leaves linear, long-acuminate, 9-11 cm long and 3-4 cm [sic] broad, flat, scabrous; ligule to 5 mm long. Panicle narrow, long-cylindrical, strongly interrupted, 6-10 cm long and 1 cm broad, with short branches appressed to the rachis and arranged in clusters of 4-5; spikelets to 4.5 mm long, narrowly elliptical, purplish- or brownish-green; glumes narrowly lanceolate, glabrous, subequal. Lemma and palea to 4.5 mm long, narrowly lanceolate, pointed; palea somewhat shorter than the lemma. August.

River banks. -East, Siberia: Len.-Kol. Endemic. Described from the lowlands of Kolyma River. (Chukotskaya Edoma, 11-13 August 1905, S. Rastorguev). Type in Leningrad.

2. *A. latifolia* (R. Br.) Griseb. in Ldb. Fl. Ross. IV (1853) 434. - *Colpodium latifolium* R. Br. in Parry Voy. App. (1824) 186. - *Catabrosa latifolia* Fries Summ. veg. I (1846-49) 245. - *Cinna Brownii* Rupr. Fl. Samoied. Cisural. (1844) 66. - *Colpodium Tilesii* Griseb. Fl. Ross. IV (1853) 385 ex parte. - *Arctagrostis stricta* V. Petr. Fl. Jakut. I (1930) 156. - *Arctagrostis glauca* V. Petr. l.c., 159. - *Arctagrostis aristulata* V. Petr., l.c., 161. - Exs.: Fries, Herb. norm. XI.

Perennial. Rhizome creeping, branched; culms ascending, 20-50 (-60) cm tall, glabrous, leafy; leaves linear, long-acuminate, flat, to 1 cm broad, rather scabrous; ligule to 5 mm long. Panicle rather contracted, oblong-linear, 4-12 cm long and to 2.5 cm broad, many-flowered, pale green, purplish, or dark brown-purple, with short, rather prominently scabrous branches; spikelets linear-lanceolate, 4-6.5 mm long, short-pedicel; glumes lanceolate, slightly unequal, the lower 1-nerved, the upper 3-nerved; lemma and palea longer than the glumes, hispidulous; lemma with a single dorsal nerve sometimes slightly excurrent in a small
 168 awn (f. *aristata* (Petr.) Roshev.); palea with two keels. June-August. (Plate XII, Figure 8).

Wet meadows in river valleys and in tundras. -Arctic: all regions; European part: Kar. -Lapl., Dv. -Pech.; West, Siberia: Ob. region (north. part); East, Siberia: all regions; Far East: Kamch., Okhot., Ze.-Bur. Gen. Distr.: Arctic, Bering., N. Am. Described from Arctic America. Type in London, cotype in Leningrad.

NOTE. An outstandingly polymorphous species, subject to variations conditioned by the extent of soil freezing; loose, sandy, stony or mossy substrate, etc. *A. stricta* and *A. glauca*, which have been separated

from it by V. Petrov (see above) cannot be rightly regarded as distinct species, as they are mutually linked by a whole series of intermediate forms distinguishable by very unreliable and inconsistent characters. Moreover, they grow side by side, without any geographical or ecological isolation.

3. *A. arundinacea* (Trin.) Beal, Grass. of N. Amer. II (1896) 317. - *Vilfa arundinacea* Trin. De gram. unifl. (1824) 157. - *A. latifolia* β *arundinacea* Griseb. in Ldb. Fl. Ross. IV (1853) 434; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II 202. - *Colpodium Tilesii* Griseb. in Ldb., l.c., 385 part. - *Vilfa gigantea* Turcz. ex Griseb. in Ldb. l.c., 385. - *Arctagrostis Tilesii* V. Petr. Fl. Jakut. I. (1930) 163. - *Arctagrostis parviflora* (Reverd.) V. Petr., l.c., 162. - l.c.: Trin. Sp. gram. un. I (1828) 55. - Exs.: HFR No 2397.

Perennial. Rhizomes creeping; culms 1-1.5 m tall, glabrous, leafy; leaves linear, long-acuminate, flat, 7-8 mm broad, very scabrous; ligule to 5 mm long. Panicle to 20 cm long and to 5 cm broad, semicontracted, with branches to 5 cm long, many-flowered, pale green or purplish; spikelets acuminate-elliptical, 5-7 (-8) mm long, more rarely 4-5 mm long (f. *parviflora* Reverd.), short-pedicel; glumes lanceolate, subequal; lemma and palea longer than the glumes, hispidulous, prominently scabrous on the keel, with obsolete lateral nerves. June-August. (Plate XII, Figure 9, a).

River banks, forests, coppices, more rarely tundra. - Arctic: Arct. Sib., Anad., West. Siberia: Irt. (introduced ?); East. Siberia: Ang. - Sayan., Daur.; Far East: Kamch., Ze. - Bur. Gen. Distr.: Arct., Bering, N. Am. Described from Alaska (Kotzebue Sound). Type in Leningrad.

4. *A. ursorum* Kom. in Sched. - *Poa ursorum* Kom. in Fedde, Repert. spec. nov. XIII (1914) 161.

Perennial. Forming large, dense tufts; rhizome branching; culms 50-120 cm tall and 3-3.5 mm thick, glabrous, leafy; leaves linear, 15-30 cm long and 6-12 mm broad, flat, finely pointed, hispid-scabrous on the margin; ligule 3-5 mm long. Panicle to 30 cm long, narrow, linear, with branches to 12 cm long, appressed to the rachis; spikelets lanceolate, 169 3-4 mm long, short-pedicel; glumes unequal, the lower 1-nerved, the upper 3-nerved, 2-3.5 mm long; lemma distinctly nerved, scabrous on the keel; palea with two keels, as long as the lemma. August.

River banks. - Far East: Kamchatka. Endemic. Described from stone drifts along the banks of Shchapinskaya River in Kamchatka. 20 July 1909. V. Komarov. Type in Leningrad.

Genus 116. CINNA* L.

L. 5p. pl. (1753) 5.

Inflorescence a large, many-flowered, loose panicle, with slender branches. Spikelets 1-flowered, perfect, the short pedicels enlarged in upper part. Glumes pointed, keeled. Lemma slightly shorter than the glumes.

* According to Discorides, a name given by inhabitants of Cilicia (surroundings of Adana) to a grass harmful to livestock.

with a short, straight awn. Palea somewhat shorter than the lemma, with one keel. Stamen solitary. Pistil short; stigmas plumose; caryopsis free.

1. *C. latifolia* (Trev.) Griseb. in Ldb. Fl. Ross. IV (1853) 435. Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 202. - *Agrostis latifolia* Trev. in Goepp. bot. Gart. Bresl. (1830) 82. - *Cinna pendula* Trin. in Mem. Acad. Petersb., ser. 6, VI, 2 (1845) 280; Shmal'g. Fl. II, 605. - *Muehlenbergia baicalensis* Trin. ex Turcz. in Bull. Soc. Nat. Mosc. XXIX, I (1856) 21. - Exs.: HFR No 543.

Perennial. Sometimes forming loose tufts, with long rhizomes; culms 60-130 cm tall, glabrous, scabrous, leafy; leaves broadly linear, to 30 cm long and 2 cm broad, flat, scabrous; ligule to 6 mm long. Panicle 15-30 cm long, loose, many-flowered; spikelets 3-4 mm long, light green, narrowly lanceolate; glumes linear-lanceolate, 1-nerved; lemma with 3-4 nerves and a short awn attached close to the summit. June-July. (Plate XII, Figure 10, a).

Damp, shady forests, mainly along rivers. - European part: Kar.-Lap., Dv.-Pech., Lad. - Il'm., Upp. Volg., - Kam., Volg. - Don., (northern part); Caucasus: Ciscauc.; West. Siberia: Irt., Alt.; East. Siberia: Ang. - Sayan., Daur.; Far East: Kamch., Ze. - Bur., Ud., Ussur., Sakh. Gen. Distr.: Scand., Jap. - Chin., N. Am. Described from Scandinavia. Type in Germany (in Bonn).

NOTE. The specimen from the Caucasus differs from the typical form occurring in the forest zone of the Eurasian mainland in having narrower leaves and a shorter awn. But in view of the fact that only a single specimen is available, we are not in a position to set it up as a distinct species.

Spikelets 1-flowered, small, arranged in a loose, rarely a more or less contracted inflorescence. Glumes longer than the lemma and palea, always awnless, the lower glume somewhat longer than the upper. Lemma thin, mostly 5-nerved, awnless or awned from the back, the awn attached on the lower 1/3, very rarely on the upper half. The rachilla, at the base of the lemma, is often furnished with 2 clusters of very short hairs which do not exceed the width of the lemma. Palea much shorter than the lemma or lacking. Lodicules very small, ovate. Caryopsis oblong-ovoid, with a narrow longitudinal groove, falling off together with the flowering bracts.

In fossilized state, one of the species *agrostis* sp. in Lena-Kolyma region (Berezovka River, Yakutia), in mammoth's food.

1. Lemma with a prominent geniculate awn exerted from the spikelet; palea usually lacking 2.
- + Lemma awnless or with a short, mostly straight, deciduous, only slightly exerted awn 7.

* From Greek *agros* - field.

** Compiled by B. Shishkin.

2. Palea $1/3-1/2$ as long as the lemma; panicle linear; ligule short; plant 5-20 cm tall 9. *A. lazical* Bal.
 + Palea lacking; panicle oblong or ovoid, loose; mostly tall plants. . 3.
3. Panicle branches scabrous, almost hairy; anthers 0.6-0.7 mm long 7. *A. anadyrensis* Soczawa.
 + Panicle branches of inflorescence scaberulous or smooth 4.
4. Panicle branches smooth or scaberulous; anthers 0.5-0.9 mm long. .5.
 + Panicle branches distinctly scabrous; anthers 1-1.2 mm long ... 6.
5. Anthers 0.5-0.7 mm long; panicle contracted; leaves 0.5-2.5 mm broad 3. *A. borealis* Hartm.
 + Anthers 0.7-0.9 mm long; panicle usually open; leaves 0.5-1 mm broad 5. *A. Trinii* Turcz.
6. Radical leaves usually folded, 0.6-1.5 mm broad, culm leaves to 2.5 mm broad; hairs at the base of lemma inconspicuous 4. *A. canina* L.
 + Radical leaves ca. 2 mm broad, culm leaves 2-6 mm broad; hairs at the base of lemma $1/4$ mm long. 6. *A. planifolia* C. Koch.
7. Annuals with strongly branching inflorescence; branches long, capillary; lemmas puberulent 8.
 + Perennials 9.
8. Leaves usually involute; panicle very loose, 7-15 cm long and 3-12 cm broad; pedicels 4-16 mm long; glumes 1.2-1.5 mm long 1. *A. Biebersteiniana* Claus.
 + Leaves flat, 1-3 mm broad; panicle more compact, 6-9 cm long and 2-6 cm broad; pedicels 1.5-5 mm long; glumes somewhat larger ... 2. *A. pisidica* Boiss.
9. Glumes subobtusate, scabrous on the entire surface due to very short hairs; palea nearly as long as the lemma; panicle dense, pale green, with branches bearing spikelets almost from their base, often lobed; anthers 0.5 mm long 29. *A. verticillata* Vill.
 + Glumes acute, smooth, glabrous only on the keel, very rarely scaberulous on the entire surface; palea $1/6-1/2$ as long as the lemma, sometimes lacking 10.
10. Anthers oval, 0.3-0.7 mm long. 11.
 + Anthers linear or linear-oblong, (0.8) 1-1.5 mm long 16.
11. Anthers 0.3-0.4 mm long 12.
 + Anthers 0.6-0.7 mm long 13.
12. Panicle loose, open; glumes 2-2.5 mm long; palea $1/7-1/5$ as long as the lemma 13. *A. clavata* Trin.
 + Panicle rather contracted; glumes 1.5-2 mm long; palea obsolete ... 14. *A. teberdensis* Litw.
13. Glumes 1.5 mm long; panicle ovoid-elliptical, 4 cm long and 2 cm broad, dark-purple-tinged 15. *A. jacutica* Schischk.
 + Glumes 2.5-3.5 mm long (plants of the Far East) 14.
14. Panicle contracted, 7-15 cm long and 0.6-2.5 cm broad; glumes tapering into a fine point 24. *A. exarata* Trin.
 + Panicle loose, spreading, 20-40 cm long and 4-8 cm broad; glumes acute 15.
15. Leaves of sterile shoots setaceous-involute, 0.3-0.6 mm broad, culm leaves 1-2 mm broad 25. *A. hiemalis* (Walt.) B. S. et Pogg.

- + All the leaves flat, 5-6 mm broad . . . 26. *A. macrothyrsa* Hack.
16. Palea lacking . . . 17.
- + Palea 1/3-1/2 as long as the lemma . . . 19.
17. Panicle oblong-linear, strongly contracted; ligule usually 1-1.5 mm long; leaves narrow, usually folded . . . 8. *A. tenuifolia* M. B.
- 172 + Panicle more or less contracted before and after flowering; ligule 2-4 mm long; culm leaves usually flat . . . 18.
18. Radical leaves usually folded, 0.6-1.5 mm broad, culm leaves to 2.5 mm broad; hairs at the base of lemma [callus hairs] inconspicuous . . . 4. *A. canina* L. f. *mutica* Gaud.
- + Radical leaves flat, ca. 2 mm broad, culm leaves 2-6 mm broad; hairs at the base of lemma 1/4 mm long . . . 6. *A. planifolia* C. Koch f. *mutica* Grossh.
19. All the leaves setaceous-involute, 0.5 mm broad . . . 21. *A. salsa* Korsh.
- + Leaves flat, broader . . . 20.
20. Glumes 2.5-3.5 mm long; a short, straight awn often attached on upper third of the lemma . . . 21.
- + Glumes 1.2-2.2 mm long; awn nearly always lacking . . . 24.
21. Branches of inflorescence glabrous; panicle strongly contracted, sometimes subspicate, 0.5-1.5 cm broad . . . 23. *A. maritima* Lam.
- + Branches of inflorescence scabrous; panicle rather loose, 2-6 cm broad . . . 22.
22. Glumes ca. 2.5 mm long; lemma with a prominent, exerted awn, sparsely hirtellous on the keel . . . 11. *A. Paulseni* Hack.
- + Glumes 3-3.5 mm long, lemma with an obscure awn which often breaks off easily, or awnless, strongly scabrous on the back . . . 23.
23. Panicle contracted, light-green, the branches scaberulous, spikelet-bearing from the base of branches. . . 10. *A. macrantha* Schischk.
- + Panicle rather loose, purple-tinged, with very scabrous branches . . . 12. *A. hissarica* Roshev.
24. Glumes very finely scaberulous on the entire surface . . . 25.
- + Glumes scabrous only on the keel . . . 26.
25. Panicle light green or light brown, the branches spikelet-bearing nearly from the base . . . 28. *A. transcaspica* Litw.
- + Panicle purple-tinged, the branches spikelet bearing from the middle . . . 27. *A. karsensis* Litw.
26. Ligule 0.31-1 mm long, sometimes obsolete; panicle usually loose, with faintly scaberulous branches . . . 22. *A. capillaris* L.
- + Ligule 2-4 mm long . . . 27.
27. Glumes small, 1.2-1.5 mm long . . . 28.
- + Glumes 2-2.5 mm long . . . 29.
28. Panicle loose; culm leaves 10-20 cm long . . . 17. *A. albida* Trin.
- + Panicle contracted, linear-lanceolate; culm leaves 2-4 cm long . . . 16. *A. sibirica* V. Petr.
29. Tufts loose, with culms decumbent on the ground and rooting, or floating on water and ascending at the ends; panicle contracted, dense . . . 20. *A. stolonizans* Bess.
- + Culms erect or ascending at the base, rather compactly tufted . . . 30.

30. Culms 40-60 cm tall, panicle dark purple, always open, the branches slender, subcapillary branches, to 10 cm long 19. *A. mongholica* Roshev.
 + Culms 30-120 cm tall, panicle usually contracted after flowering, greenish or brownish-purple, the branches scaberulous, slender, but not capillary 18. *A. alba* L.

Subgenus 1. *Airagrostis* (Griseb.) Schischk. -Section *Airagrostis* Griseb. in Ldb. Ross. IV (1853) 439. -Glumes obtuse, equal, small; palea lacking; lemma obtuse, always awnless. Annual plants, with atrichotomous panicle and long, capillary branches.

1. *A. Biebersteiniana* Claus, Beitr. z. Pflanzenk. d. Russ. Reich., VIII (1851) 264. -*A. capillaris* M.B. Fl. taur.-cauc. I (1808) 56 (non L.) -*A. trichoclada* Griseb. in Ldb. Fl. Ross. IV (1853) 439; Shmal'g. Fl. II, 607.

Annual. Forming clusters containing several culms, culms 10-35 cm tall, slender (0.5-1.5 mm in diameter); leaves linear, involute, 1.5-7 cm long and 0.5-1.5 mm broad; ligule oblong, blunt, to 2 mm long on the upper leaves. Panicle very loose, trichotomous, 7-15 cm long and 3-12 cm broad, with capillary, glabrous, obliquely spreading branches; pedicels 3.5-16 mm long, clavate, glabrous; glumes ovate, 1.2-1.5 mm long, subobtuse, glabrous, pale green on the back, whitish on the margins; lemma about as long as the glumes, pubescent on the entire surface; anthers 0.8 mm long; caryopsis ovoid, 0.3 mm long. June-September. (Plate XIII, Figure 1, a-c).

Wet meadows. -European part: Crimea, low. Volg. (Krasno armeisk, villages Ivanovka and Bykovo); Caucasus: Ciscaucasia (Kislovodsk), East. Transcauc. (Bechenakh). Endemic. Described from Krasnoarmeisk. Type in Leningrad.

2. *A. psidica* Boiss. in Tchihatch. Asie mineure. Botanique II (1860) 625, tab. 43. -*A. densior* (Hack.) Grec. Consp. Fl. Roman. (1898) 7. -*A. Biebersteiniana* var. *densior* Hack. in Grec. l.c. -*A. biebersteiniana* auct. Fl. Transc. ex parte. -*A. heteropoda* Trautv. in herb. -Exs.: Grossh. et Schischk. Pl. Or. No 326 (sub *A. Biebersteiniana*).

- 174 Annual. Culms bunched several together, 10-45 cm tall, slender, 0.5-1.5 mm in diameter; leaves linear, flat, 2-14 cm long and 1-3 mm broad; ligule oblong, blunt, ca. 3 mm long on upper leaves. Panicle loose, 6-9 cm long and 2-6 cm broad with glabrous capillary, obliquely spreading branches; pedicels 1.5-6 mm long, clavate; glumes ovate, acute, 1.8 mm long, green on the back, whitish on the margins, glabrous; lemma about as long as the glumes, puberulent on the entire surface; anthers oblong-linear, 0.5-0.7 mm long; caryopsis ovoid, 1.7 mm long. June-July.

Dry alpine meadows and river valleys. -Caucasus: East. Transcauc. (Bakuriani, Akhalkalaki, Nor-Bayazet.). Gen. Distr.: Asia Min., Rumania. Described from Pisidia. Type in Geneva.

Subgenus 2. *TRICHODIUM* (Michx.) Rouy. Fl. de France XIV (1913) 64. -Genus *Trichodium* Michx. Fl. bor.-amer. I (1803) 41. -Section *Trichodium* Koch, Syn. ed., 2 (1845) 903. -Lemma with a geniculate awn attached on the lower 1/3 of the back, very rarely awnless; palea usually lacking.

Section 1. Caninae Schischk. -Palea lacking.

3. *A. borealis* Hartm. Scand. Fl. 4 Uppl. (1838) 23; Krylov, Fl. Zap. Sib. (Fl. West. Sib.) II, 205. -*A. rupestris* Griseb. in Ldb. Fl. Ross. IV (1853) 433 non All. -*A. viridissima* Kom. in Fedde, Repert. XIII (1914) 85. -*lc.*: Ostenf. Fl. Arct. I, 109. -*Exs.*: HFR No 2685.

Perennial. Rhizome short; culms tufted, erect, smooth, 15-40 cm tall; leaves narrowly linear, 2-8 cm long, 0.5-2.5 mm broad, acuminate, flat, only the radical leaves occasionally folded, smooth, slightly scaberulous at the apex; ligule subobtusate, serrate on the upper leaves, to 2 mm long. Panicle rather loose, 4-7 cm long and 1-3 cm broad, the smooth branches arranged on the axis in clusters of 2-3; glumes elliptical-lanceolate, acute, brownish-purple, more rarely brownish-yellowish; the lower glume scaberulous on the keel in upper part, 2.5-3 mm long, the upper glume smooth, 2-2.5 mm long; lemma obtusish, 1.5-2 mm long, furnished with a geniculate awn, 3-4 mm long and attached just above the lower 1/3; anthers oval, 0.5-0.7 mm long. June-July. (Plate XIII, Figure 9, a-d).

Coastal sands, wet meadows, alpine tundras, clay slopes, and shrubby thickets. -Arctic: Arct. Eur., Arct. Sib.; European part: Kar. -Lap., Dv. -Pech.; Far East: Kamch. Gen. Distr.: North. Europe (Iceland, Swed., Norway, Lapland, Finland), N. Am. Described from Scandinavia.

4. *A. canina* L. Sp. pl. (1753) 62; Griseb. in Ldb. Fl. Ross. IV 440; Shmal'g. Fl. II, 606; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 204. -*A. coarctata* Ehrh. ex Hoffm. Fl. germ. ed. 2. I (1800) 37. -*lc.*: Rchb. Ic. Fl. Germ. I, tab. 33.

- 175 Perennial. Rhizome short, thin, giving rise to sterile shoots and culms, the latter few or many, erect or ascending at the base, 20-60 cm tall; radical leaves folded, 0.6-1.5 mm broad, culm leaves usually flat, 2-8 cm long and 0.5-2.5 mm broad, scabrous on the margins and often on the surface; ligule oblong, obtuse, 2-3 mm long on the upper leaves. Panicle contracted before and after flowering, 4-11 cm long and 1-5 cm broad, the scabrous branches in clusters of 3 to 6; glumes dark purple, more rarely brownish-straw-yellow, elliptical-lanceolate, 2-2.5 mm long, the lower glume scabrous on the keel in upper part, the upper glume smooth; lemma 1/2-2/3 as long as the glumes, the geniculate awn dorsally attached on the lower 1/3, exserted, or lemma awnless (f. *mutica* Gaud.); hairs at the base of lemma very short, scarcely perceptible, 0.1 mm long; anthers linear-oblong, 1-1.2 mm long. June-July.

Boggy and wet meadows, river valleys. -European part: all regions except Prichern. and Crimea; West. Siberia: all regions; East. Siberia: Yenisei, Ang. -Sayan., Daur. (?); Far East: Kamch., Okhot., Ud. region, Sakh., Ussur. Gen. Distr.: Atl. and Centr. Eur., North. Mongolia. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Suitable for bedding and lawn establishment, as it furnishes more delicate and graceful verdure than any other grass; easily propagated vegetatively. Readily eaten by livestock prior to flowering.

5. *A. Trinii* Turcz. Fl. baic. -dahur. in Bull. Soc. Nat. Mosc. XXIX, 1 (1856) 18 in nota. -*Exs.*: HFR No 1249.

Perennial. Rhizome fairly thick, giving rise to numerous thin roots; culms tufted, erect, 20-50 cm tall; leaves usually narrowly linear, involute,

more rarely flat, 4-10 cm long and 0.5-1.5 mm broad, smooth; ligule on upper leaves 2 mm long, usually lacerate at the apex; glumes purple-tinged, subequal, 2-2.5 mm long, elliptical-lanceolate, the lower glume scabrous on the keel in the upper part; lemma very slightly shorter than the glumes, the geniculate awn attached on the lower 1/3, exserted; palea lacking anthers yellowish or purple, linear, 0.7-1 mm long. June-August. (Plate XIII, Figure 5 a-d).

Boggy and waterless-valley meadows, steppe slopes and commons. - East Siberia: Ang. -Sayan, Yenisei, Len.-Kol., Daur., Far East: Ze.-Bur., Ud. region, Okhot., Kamch., Ussur. Endemic. Described from Baikal. Type in Leningrad.

ECONOMIC IMPORTANCE. A fairly valuable forage plant for cattle and sheep.

176 6. *A. planifolia* C. Koch in Linnaea XXI (1848), 380; Griseb. in Ldb. Fl. Ross. IV, 441. -*A. calamagrostoides* Rgl. in Ind. sem. Hort. Petrop. (1865) 38. -*A. Ruprechtii* Boiss. Fl. Or. V (1884) 517. -*Calamagrostis agrostoides* Boiss. Fl. Or. V (1884) 522. -*Agrostis macrostachya* Bordz. in Bull. du Jard. bot. Kieff, May-June (1927) 18. -Exs.: HFR, No 2685 et No 2681 b, No 2683 (sub *A. canina* var. *stolonifera* et var. *mutica*).

Perennial. Culms robust, tufted, 20-80 cm tall, erect, often ascending at the base, glabrous; leaves flat, those of the culm 4-12 cm long and 2-6 mm broad, those of the innovations narrower, to 1 mm broad; ligule on upper leaves oblong, 2-4 mm long, truncate; panicle rather contracted, 3-10 cm long and 1-5 cm broad, with scabrous, upward-pointing branches; glumes lanceolate-elliptical, 2-2.5 mm long, purple or dark-purple tinged, scabrous on the keel in upper part; lemma very slightly shorter than the glumes, subobtus, the geniculate or straight awn attached at the middle or below the middle of the back, usually exserted, more rarely awn very short or lacking (f. *mutica* Grossh.); hairs at the base of lemma 0.25 mm long; palea lacking; anthers linear, ca. 1 mm long. June-August. (Plate XIII, Figure 3 a-d).

Subalpine and alpine mountain meadows. -Caucasus: Gr. Cauc., West. and East. Transcauc. Gen. Distr.: Turk. Armen. Described from Transcaucasia. Type in Berlin.

ECONOMIC IMPORTANCE. A good forage plant.

7. *A. anadyrensis* Soczawa, sp. nov. in Addenda p. 746.

Perennial. A loosely tufted plant, with numerous erect culms, 35-40 cm tall, leaves linear, 10 cm long and 3-4 mm broad; ligule oblong, 2-3.5 mm long, rounded and fimbriate at the apex. Panicle rather contracted, 10-15 cm long and 1-2 cm broad, with slender, erect, scabrous branches; glumes greenish-purple, ovate-lanceolate, acute, glabrous, ciliate only on the keel, 2-2.5 mm long, the lower glume somewhat longer than the upper; lemma somewhat shorter than the glumes, awned from the middle of the back, the awn geniculate, exserted 1-1.5 mm; anthers light yellow, 0.6-0.7 mm long. August. (Plate XIII, Figure 8 a-d).

Riverside sands. -Arctic: Anadyr' region. Endemic. Described from the borders of Belaya River, at the foot of Bigo Mountain. Type in Leningrad.

8. *A. tenuifolia* M. B. Fl. taur. -cauc. I (1808) 56; Griseb. in Ldb. Fl. Ross. IV, 441. -*A. canina* var. *tenuifolia* Boiss. Fl. Or. V

(1884) 516. -Ic.: Trin. Spec. gram. I (1838) tab. 35. -Exs.: HFR No 2679 and 2683 (sub *A. canina* var. *mutica*).

Perennial. Rhizome short, often branching; culms 20-40 cm tall, slender, erect or slightly geniculate, glabrous; all leaves alike, setaceous-involute, those of the culm 5-10 cm long and 0.5-1 mm broad, very rarely leaves flat, 2-3 mm broad; ligule 1-1.5 (2.5) mm long. Panicle oblong-linear, rather contracted, 5-12 cm long and 0.5-2 cm broad, with obliquely ascending, 177 short, scabrous branches divided from their middle; pedicels shorter than the spikelets or as long; glumes lanceolate, purple-tinged or greenish, 2-2.2 mm long, subequal, scabrous on the keel; lemma shorter than the glumes, awnless (f. *mutica* Lavr.) or with a short awn (f. *aristata* Lavr.) attached about the middle of the back. Palea lacking; anthers ca. 1 mm long. (Plate XIII, Figure 10, a-c).

Dry slopes. -European part: Upp. Volg., Volg.-Kam. (Atkarsk Raion), Volg.-Don., Zavolzh., Upp. and Mid. Dnep.; Caucasus: Ciscauc., West. (Abkhazia, Guria) and East. Transcauc. (Azerbaijan). Endemic. Described from Beshtau Mountain. Type in Leningrad.

Series 2. *Lazicae* Schischk. -Palea present.

9. *A. lazica* Bal. in Bull. Soc. Bot. Fr. XXI (1874) ex parte; Boiss. Fl. Or. V (1884) 515. -*A. rupestris* auct. Fl. cauc., non All.

Perennial. Rhizome short, stoloniferous; culms tufted, 9-20 cm tall, ascending at base; leaves of sterile shoots folded, ca. 0.5 mm broad, those of the culm flat, 3-6 cm long and 1-2.5 mm broad, smooth; ligule short, truncate, on upper leaves 1-1.5 mm long. Panicle contracted, linear, 2-5 cm long and 4-7 mm broad, with slender, scabrous, erect branches; glumes purple-tinged, lanceolate, 2.5 mm long, scabrous on the keel in upper part, glabrous elsewhere; lemma 2 mm long, awn attached at the middle of the back or below, straight or bent, usually exerted; palea 1/3-1/2 as long as the lemma; anthers oblong, 0.5-0.7 mm long. July-August.

Alpine meadows. -Caucasus: Gr. Cauc., Centr. and East. part, West. Transcauc., Dag. Gen. Distr.: Turk. Laz. Described from Lazistan Mountains, alt. 2,500 m. Type in Geneva.

ECONOMIC IMPORTANCE. Satisfactorily grazed in pasture.

Subgenus 3. *Vilfa* (Adans.) Rouy, Flore de France XIV (1913) 60. -Genus *Vilfa* Adans. Fam. II (1763) 495. -Lemma and palea very unlike; lemma usually obtuse, at most 1/4 as long as the glumes, awnless or furnished with a short, usually straight awn.

Series 1. *Aristulatae* Schischk. -Spikelets large, 2.5-3.5 mm long; lemma mostly furnished with a short, deciduous awn, attached close to summit.

10. *A. macrantha* Schischk. sp. nov. in Addenda p. 746. -

Perennial. Rhizome thin, giving rise to numerous thin roots; culms ascending at base, geniculate, smooth, 30-40 cm tall; leaves linear, long-acuminate, flat, 8-13 cm long and 2.5-5 mm broad, scabrous; ligule on upper leaves acute, 5-6 mm long. Panicle contracted, dense, 10-13 cm long and 2-4 cm broad, main axis smooth, branches scabrous, obliquely rising, the lower branches in clusters of 7, the upper ones in clusters of 178 2 to 3, spikelet-bearing from near the base; glumes light green, lanceolate, finely pointed, prominently scabrous on the keel from the lower third to the summit, scarcely scabrous elsewhere, 3.5 mm long, subequal, the upper

somewhat shorter than the lower; lemma 2.2 mm long, with a straight awn, ca. 1 mm long, attached close to the summit; palea 1.4 mm long; anthers linear, 1.2 mm long. July.

Light forests. -Caucasus: West. Transcauc. (Novorossiisk Raion). Endemic. Described from Gelendzhik. Type in Leningrad.

11. *A. Paulseni* Hack. ex Pauls. in Kjoeb. Vidensk. Meddel. (1903) 165.

Perennial. Rhizome short, giving rise to numerous thin roots; culms tufted, smooth, erect, 45-50 cm tall; leaves flat, narrowly linear, 6-15 cm long, 2-3 mm broad, acuminate, scarcely scaberulous; ligule on upper leaves 2.5-3 mm long, blunt. Panicle loose, 7-18 cm long and 1.5-4.5 cm broad, with slender, scabrous, erect branches; glumes pale green, sometimes with a slight purple bloom, elliptical, lanceolate, subequal, 2.5-2.75 mm long, ciliate on the keel, glabrous elsewhere; lemma 1.75 mm long, the awn attached on the upper third of the back, exserted; palea 0.75 mm long; anthers ca. 0.8-1 mm long. August-September. (Plate XIII, Figure 12 a-e).

Wet places. -Centr. Asia: Pam. -Al., source of the river Pamir (3,800 m) and along Kirgiz-su in Irkh. Endemic. Described from the source of the river Pamir. Type in Vienna.

12. *A. hissarica* Roshev. Not. syst. Herb. Horti Bot. Petrop. IV (1923) 93.

Perennial. Culms few, erect or ascending at the base, smooth, 50-75 cm tall; leaves flat, scabrous, long-acuminate, 15-18 cm long and ca. 5 mm broad; ligule oblong, truncate or lacerate, 3-5 mm long on the upper leaves. Panicle rather loose, 5-20 cm long and 1-6 cm broad, the branches rather appressed, prominently scabrous, in clusters of 3 to 7; glumes purple-tinged, lanceolate, pointed, subequal, 3-3.5 mm long, densely scabrous on the back; lemma 2.5 mm long, often purple-tinged, awnless or furnished with a short, straight, occasionally slightly bent, deciduous awn; palea 1.5 mm long; anthers 1.5 mm long. July-August. (Plate XIII, Figure 4, a-d).

Wet subalpine meadows and borders of mountain streams. -Centr. Asia: Pam. -Al. (Uch-Shada, rivers Yagnob and Sorbo), Tyan'-Shan (Otuz-art Gorge, below Taldy-bel' Pass, Arslanbad Mountains, Uzun-Akhmat Range, and the upper course of Turduk River). Endemic. Described from Pamir-Al. and Tyan'-Shan. Type in Leningrad.

Series 2. *Clavatae* Schischk. -Anthers very small, 0.3-0.4 mm long; spikelets 1.5-2.5 mm long.

13. *A. clavata* Trin. in Spreng. Neue Entdeck. II (1821) 55; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 208. -*A. laxiflora* Griseb. in Ldb. Fl. Ross. IV (1853) 441 non R. Br.

179 Perennial. Rhizome short with thin fibrous roots; culms tufted, erect, 30-70 cm tall; leaves flat, linear or narrowly linear, 1.5 mm broad, scabrous on the margins and occasionally on the nerves; ligule 1-3 (4) mm long on the upper leaves, obtuse. Panicle loose, open, 10-30 cm long and 3-10 cm broad, with slender, prominently scabrous, erect branches; glumes greenish or light brownish-purple, elliptical-lanceolate, acute, 1-nerved, obscurely 3-nerved at the base, 2-2.5 mm long, the lower glume somewhat longer than the upper; lemma slightly shorter than the glumes, 1.6-1.75 mm long; palea 1/7-1/5 as long as the lemma; anthers 0.3-0.4 mm long;

caryopsis ca. 1 mm long. June-July. (Plate XIII, Figure 14 a-c).

Wet meadows, coniferous forests, and coppices. -European part: Dy. - Pech., Volg. -Kam.; West Siberia: Ob. region, Alt.; East Siberia: all regions; Far East: Kamch., Okhot., Ze. -Bur., Sakh. Gen. Distr.: Scand., Jap. -Chin. Described from Kamchatka. Type in Leningrad.

ECONOMIC IMPORTANCE. Readily eaten up to flowering time.

14. *A. teberdensis* Litw. in Sched. ad. Herb. Fl. Ross. VIII, Fasc. LIV (1922) 139. -Exs.: HFR No 2678.

Perennial. Rhizome thin; culms delicate, smooth, 20-30 cm tall; leaves flat, those of the culm 4-8 cm long and 2-4 mm broad, those of the innovations ca. 1 mm broad, scabrous; ligule oblong, obtuse, ca. 2 mm long on the upper leaves. Panicle rather contracted, 8-20 cm long and 2-6 cm broad, often bearing a small number of spikelets, the branches capillary, scabrous; glumes lanceolate, acute, scabrous on the keel in upper part, 1.5-2.0 mm long; lemma slightly shorter than the glumes, awnless; palea obsolete; anthers 0.3 mm long. July.

Forests. -Caucasus: Gr. Cauc. (Teberda, Sukan, Khyzny). Endemic. Described from Teberda River at alt. 1,300 m. Type in Leningrad.

Series 3. *Micranthae* Schischk. -Spikelets small, 1.2-1.5 mm long; anthers 0.6-1 mm long.

15. *A. jacutica* Schischk. sp. n. Addenda p. 747. -*A. stolonizans* V. Petr. in Fl. Jacutiae I (1930) 177 cum fig. 58, non Bess.

Perennial. Rhizomatous, producing numerous sterile shoots and a small number of culms, compactly tufted; culms erect or ascending at the base, 20-30 cm tall; leaves narrowly linear, long-acuminate, ca. 5 cm long and 1 mm broad; ligule oblong on the upper leaves, pointed, ca. 2 mm long. Panicle ovoid-elliptical, 4 cm long and 2 cm broad, with a glabrous main axis and scaberulous branches; glumes purple-tinged, elliptical-lanceolate, pointed, subequal, 1 1/4 mm long, the lower glume scabrous on the keel in upper part; lemma 1/5 shorter than the glumes, with mid-nerve prolonged into an awn-point. Palea 1/3 as long as the lemma; anthers ovoid-oblong, 0.6 mm long, yellowish. July.

100 Borders of lakes. -East, Siberia: Len. -Kol. (Yakutsk District). Endemic. Described from the upper part of the basin of Sinyaya River, Bagadzha-Yryakh village, Byrylakhskaya cossack village. Type in Leningrad.

16. *A. sibirica* V. Petr. in Fl. Jakutiae I (1930) 175, fig. 57.

Perennial. Culms slender, tufted, 25-40 cm tall, geniculate at the lower nodes; leaves flat, linear, 2-4 cm long and 2.5-3 mm broad, short-pointed at the apex, stiff, scabrous; ligule obliquely rounded at the apex, entire, 2-2.5 mm long. Panicle contracted, with erect, scaberulous branches in clusters of 7 to 8; glumes greenish-purple, lanceolate, subequal, ca. 1.5 mm long, scabrous on the keel toward the summit; lemma slightly shorter than the glumes, awnless; palea 1/2 as long as the lemma; anthers narrowly linear, 0.8-1 mm long. June-July.

Wet meadows. -East, Siberia: Ang. -Sayan., Daur., Len. -Kol. Endemic. Described from the vicinity of Olekminsk Mountain in Yakutia. Type in Leningrad.

17. *A. albida* Trin. in Mém. de l'Acad. Sc. Pétersb., sér. 6. VI, 2 (1845) 344.

Perennial. Rhizome short, roots fibrous; culms erect, geniculate at the base, 40-60 cm tall; leaves of sterile shoots narrowly linear, 1-2 mm

broad, those of the culm 15-20 cm long and 3-3.5 mm broad, scabrous on the lower surface; ligule obtuse, 2-3 mm long on the upper leaves. Panicle loose, open or rather contracted, 10-17 cm long and 1-4 cm broad, with scabrous main axis and scabrous branches arising in clusters of 9 below and of 4-5 above; pedicel shorter than the spikelet or twice as long, scabrous; glumes pale greenish or pale yellowish, acute, subequal, 1.2-1.5 mm long, the lower glume scabrous down to its middle, the upper one only at the summit; lemma slightly shorter than the glumes; palea 1/2 as long as the lemma; anthers ca. 1 mm long. June-July.

Meadows and wet solonchaks. - European part: Low. Don. (Krasnoarmeisk), Low. Volg. (Astrakhan'), Valuika Novouz River, Ural'sk. Endemic. Described from Krasnoarmeisk. Type in Leningrad.

Series 4. *Albae* Schischk. - Spikelets 2-2.5 mm long, anthers 1-1.5 mm long.

18. *A. alba* L. Sp. pl. (1753) 63; Griseb. in Ldb. Fl. Ross. IV, 496; Shmal'g. Fl. II, 605; Kryl. Fl. Zap. Sib. II, 206. - *A. stolonifera* L. Sp. pl. (1753) 62 ex parte. - Ic.: Fl. Dan. X, tab. 1623.

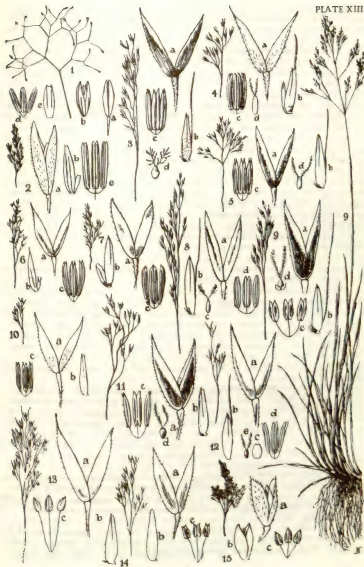
Perennial. Rhizome branching; culms erect or ascending at base, 30-120 cm tall; leaves flat, scabrous on the nerves and margins, those of the culm 5-20 cm long and 1-8 mm broad. Panicle loose, more or less contracted after flowering, 7-30 cm long and 1.5-10 cm broad, with upright, rarely horizontally spreading, scabrous branches arising from main axis in clusters of 5 to 15; glumes elliptical-lanceolate, brownish-purple or greenish, acute, 2-2.5 mm long; the lower glumes prominently scabrous on the keel, the upper one without a keel and more or less smooth. Lemma one-fourth to one-fifth shorter than the glumes, awnless or very rarely bearing a short, deciduous awn; palea 1/3 to nearly 1/2 shorter than the lemma; anthers 1-1.5 mm long; caryopsis oblong 1-1 1/4 mm long. June-August.

Wet meadows, meadow bogs, river valleys, borders of lakes, and forest borders. - All over the U. S. S. R., with the exception of Arctic and high-mountain areas. In the Far East as an adventive plant close to human habitations. Gen. Distr.: all Western Europe except the arctic region, North Afr., As. Min., Iran, Tibet, Himal., Jap., Chin., N. Am., Greenl., and Austral. (introduced). Described from Europe. Type in London.

ECONOMIC IMPORTANCE. In the forest zone this plant yields succulent and nutritious herbage. It is particularly suitable for establishment of

Explanation to Plate XIII

1. *Agrostis Biebersteiniana* Clauz. a) and b) spikelet; c) lemma; d) stamens. - 2. *A. transcaucasica* Litw.: a) spikelet; b) lemma and palea; c) stamens. - 3. *A. planifolia* C. Koch: a) glume; b) lemma; c) stamens; d) ovary. - 4. *A. hissarica* Roshev.: a) glumes; b) lemmas; c) stamens; d) ovary. - 5. *A. Trinii* Turcz.: a) glumes; b) lemma; c) stamens; d) ovary. - 6. *A. capillaris* L.: a) glumes; b) lemma and palea. - 7. *A. salsa* Korsh.: a) glumes; b) palea and lemma; c) stamens. - 8. *A. anadyrensis* Socz.: a) glumes; b) lemma; c) ovary; d) stamens. - 9. *A. borealis* Hartm.: a) glumes; b) lemma; c) stamens; d) ovary. - 10. *A. tenuifolia* M. B.: a) glumes; b) lemma; c) stamens. - 11. *A. hirsutissima* (Walt.) R. S. et P.: a) glumes; b) lemma; c) stamens; d) ovary. - 12. *A. Paulseni* Hack.: a) glumes; b) lemma; c) palea; d) stamens; e) ovary. - 13. *A. exarata* Trin.: a) glumes; b) lemma; c) stamens. - 14. *A. clavata* Trin.: a) glumes; b) lemma; c) stamens. - 15. *A. verticillata* Vill.: a) spikelet; b) lemma; c) stamens.



pasture on wet soils. On dry soils the culms and leaves become rather tough and are less suitable as fodder. Valued as a low grass in mixtures for permanent meadows, at the rate of up to 20 per cent. Seeds retain their germinating power for a number of years. Mean yield of hay in the forest zone in natural hayfields is 12-18 centners, under cultivation 25-35 centners per hectare. The percent composition of hay is 7.6 protein, 2.3 fats, 26.1 cellulose, 44.0 nonnitrogenous extractable substances, 5.7 minerals, and 14.8 water.

NOTE. Exceptionally variable in its vegetative parts; larger plants with culms ca. 1 m tall and leaves 6-11 mm broad are designated as var. *gigantea* (Roth) Mey. It would perhaps be proper to nullify the name *A. alba* L. and to split the species up. However, in view of the inadequate knowledge of the whole plant cycle encompassed by this name, it is as yet impossible to delimitate satisfactorily all the distinct strains. We have treated some of the better known forms of the compound species as separate species (*A. karsensis* Litw., *A. mongholica* Roshev., *A. transcaspica* Litw., *A. sibirica* V. Petr., etc.). Most outstanding among
184 the numerous varieties of *A. alba* presented in the literature is the one named var. *gigantea* (Roth) Mey. But this designation refers apparently to a wide range of forms, and it is impossible at present to give a description of the strains brought together under the name *gigantea*.

19. *A. mongholica* Roshev. Nov. Mong. Zlaki v sev. Mongolii. Predv. otch. geol., geokh. i pochv. geogr. eksped. o rabot. proizv. v 1915 g. (Prelim. Acc. of the Geol., Land Use and Soil Geogr. Exped. of studies conducted in 1915). Izd. Akad. Nauk SSSR (Publ. Acad. Sci. USSR) (1926) 162; Jard. Bot. Princ. XXVIII (1929) 381.

Perennial. Rhizome short, with numerous erect culms, 40-60 cm tall; leaves linear, flat, sometimes with more or less purple-tinged sheaths, 3-15 cm long and 1-2 mm broad, scabrous on the nerves and on the margins; ligule oblong, 2.5-3 mm long on the upper leaves. Panicle open, 12-18 cm long and 5-10 cm broad, the branches obliquely rising, slender, subcapillary, scabrous, to 10 cm long; glumes elliptical-lanceolate, acute, dark purple, scabrous and the keel, ca. 2 mm long; lemma 1/5-1/4 shorter than the glumes, awnless or bearing a short, straight awn; anthers linear-oblong. June-August.

Wet meadows. -West, Siberia: East, submont. Alt., East, Siberia: Ang.-Sayan, Daur. Gen. Distr.: Northern Mongolia. Described from Northern Mongolia. -Uber-Dzhargalanty River. Type in Leningrad.

20. *A. stolonizans* Bess. in Roem. et Schult. Mant. III (1827) 567 in adnot. -*A. prorepens* G. Mey. Korresp. Bl. Naturf. Ver. Riga, XXVI (1883) 56; Goloubeva in Journ. bot. Russ. VIII (1924) 120. -*A. alba* var. *stolonifera* Meyer, Chlor. Hannov. (1836) 656; Griseb. in Ldb. Fl. Ross. IV, 437 partim.

Perennial. Rhizome thin, giving rise to long (to 20 cm), rooting stolons; culms ascending, becoming erect, 20-60 cm tall; leaves linear or lanceolate-linear, 3-6 cm long and 1-4 mm broad, rather scabrous on the margins and nerves; ligule oblong, obtuse, with toothlike incisions at the apex, 1-2 mm long. Panicle contracted, oblong, 5-10 cm long and 0.5-1.5 cm broad, with short, obliquely rising, scabrous branches; pedicels 0.5-3 mm long; glumes greenish, elliptical-lanceolate, 2.2 mm long, subequal, prominently scabrous on upper part of the keel; lemma 1-7 mm long; palea

1/2 as long as the lemma; anthers ca. 1 mm long. June-August.

Wet sites in river flood-plains. -European part: all regions except Crimea; Caucasus: Ciscauc. Gen. Distr.: Europe. Described from Galicia. Cotype in Leningrad.

21. *A. glasa* Korsh. in Tr. SPb. Obshch. Est., No 1 (1897) 8.

Perennial. Rhizome short, roots numerous, fibrous; culms in compact tufts, smooth, erect or ascending at the base, 20-40 cm tall; leaves setaceous-involute, 0.5 mm broad, scabrous, finely pointed; ligule oblong, pointed, 185 ed, 2.5-4.5 mm long on the upper leaves. Panicle narrow, 4-8 cm long and 0.5-1 cm broad, with erect, scabrous branches in clusters of 3-5; glumes purple-tinged, elliptical-lanceolate, subequal, ca. 2 mm long, scabrous on the upper part of the keel, glabrous elsewhere; lemma 1.5 mm long, sometimes with a short dorsal awn arising from the upper third, hairless at the base; palea 0.7 mm long; anthers linear-oblong, ca. 1 mm long. August. (Plate XIII, Figure 7 a-c).

Solonchaks. -West. Siberia: Upp. Tob. (at the foot of Durtel' chalk mountain, near the village Khalilova by the river Bol'shaya Guberlya). Endemic. Described from the site indicated. Type in Leningrad.

22. *A. capillaris* L. Sp. pl. (1753) 62; Griseb. in Ldb. Fl. Ross. IV 439. -*A. vulgaris* With. Arrang. (1776) 132. -*A. tenuis* Sibth. Fl. Oxon. (1794) 36. -*A. stolonifera* L. Sp. pl. (1753) 62 ex parte. -*A. polymorpha* Huds. Fl. angl., ed. 2, 1 (1778) 31 partim. -*A. trinervata* Trin. Gram. agrost. in Mem. Ac. Petersb. ser. 6. IV (1845) 347. -*lc.*: Rchb. *lc.* Fl. Germ. I, tab. 34.

Perennial. Rhizome short, creeping, stoloniferous; culms erect or ascending at the base, 10-60 cm tall, sometimes scabrous below the panicle; leaves flat, narrowly linear, scabrous on the margins, almost smooth on the surface, 1-4 mm broad; ligule short, obtuse, 0.5-1.5 (2) mm long, rather frequently obsolete. Panicle open, 2-15 cm long and 6 cm broad, the branches obliquely rising, capillary, scaberulous, often almost smooth; glumes brownish-purple, elliptical-lanceolate, acute, 1.5-2 mm long, subequal, scabrous on the upper part of the keel; lemma 1/5-1/4 shorter than the glumes, awnless; palea nearly 1/2 shorter than the lemma; anthers linear-oblong, ca. 1 mm long; caryopsis ovoid, 1 mm long and 0.3 mm broad. June-July. (Plate XIII, Figure 6 a, b).

Waterless-valley and flood-land meadows, thinned-out forests, forest edges, borders of streams and lakes, and coastal sands. -European part: all regions; Caucasus: all regions; West. Siberia: all regions; East. Siberia: Yenisei, West. part of Ang. -Sayan. Gen. Distr.: nearly all Europe, West. and North. Asia, N. Africa, N. Am. Introduced in St. Helena Island. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. The species described constitutes a valuable grass for poor soils. Suitable for production of a fine, delicate sward.

23. *A. maritima* Lam. Encycl. I (1789) 61. -*A. alba* var. *maritima* Meyer, Chlor. Hannov. (1836). 656. -*lc.*: Rchb. *lc.* Fl. Germ. I, tab. 36.

186 Perennial. Rhizome thin, giving rise to long, rooting stolons; culms numerous, erect or ascending, 7-40 cm tall; leaves linear or lance-linear-acuminate, often folded, 2-8 cm long and 1-2.5 mm broad, smooth; ligule oblong, obtuse, 1-3 mm long. Panicle contracted, oblong-linear, sometimes spikelike, 2-10 cm long and 0.5-1.5 cm broad, with short, smooth

branches; glume light or dark brown, elliptical-lanceolate, acute 2.5-3 mm long, subequal, glabrous on the keel; lemma ca. 2-2.5 mm long, awnless or with a short, straight, deciduous awn, attached near the summit; palea ca. 1-1.5 mm long; anthers ca. 1.5 mm long. June-August.

Sandy or maritime solonchets sites and coastal rocks. -Arctic: Kola Peninsula (Murmansk coast, village Kandalsksha and town Aleksandrovsk, at the estuary of Kamenka River). Kanin Peninsula; European part: Dv. -Pech. (Dvina estuary, Arkhangel'sk). Gen. Distr.: Atl. Eur., Centr. Eur., Scand. Described from surroundings of Narbonne (France).

Series 5. *Extremo-orientales* Schischk. -Spikelets large, 3-3.5 mm long; lemma mostly awnless; anthers 0.5-0.7 mm long.

24. *A. exarata* Trin. Diss. I (1824) 207; Griseb. in Ldb. Fl. Ross. IV, 441. -lc.: Trin. Spec. Gram. I (1828) tab. 27.

Perennial. Rhizome short, roots numerous; culms in compact tufts, erect or ascending at the base, 20-45 cm tall, glabrous; leaves linear, 2.5-5 mm broad, scaberulous; ligule obtuse, 4-4.5 mm long on the upper leaves. Panicle dense, 7-15 cm long and 0.6-2.5 cm broad, with erect, scabrous branches; glumes lanceolate, finely pointed, scabrous on the keel, 3-3.5 mm long, the lower glume about 1/2 mm longer than the upper; lemma 2 mm long, usually awnless, rarely with a short awn attached at the upper 1/2 of the back; palea 1/3-1/2 as long as the lemma; anthers oval, 0.5 mm long. June-August. (Plate XIII, Figure 13, a-c).

Meadows. -Far East: Kamchatka. Gen. Distr.: N. Am. Described from Unalaska. Type in Leningrad.

25. *A. hiemalis* (Walt.) Britt, Sterns, et Pogg. Prelim. Catal. (1888) 68. -*Cornucopiae hiemalis* Walt. Fl. Carolin. (1788) 72. -*Agrostis laxiflora* Poir. Encycl. Meth. Suppl. I (1810) 255. -lc.: Britt, et Brown, III. Fl. N. Stat. I, 161.

Perennial. Rhizome short, roots numerous, thin; culms forming a dense tuft, 30-50 cm tall; leaves of sterile shoots setaceous-involute, 0.3-0.6 mm broad, those of the culm narrowly linear, 3-12 cm long and 1-2 mm broad; ligule on the upper leaves pointed, 2-3 mm long. Panicle loose, open, 20-40 cm long and 6-15 cm broad, the slender, scabrous branches crowded in whorls; glumes purple-tinged, lanceolate, subequal, 187 2.5-3.5 mm long, prominently scabrous on the keel; lemma usually awnless, 1/3 or nearly 1/2 shorter than the glumes, 1.5-2 mm long; palea very small; anthers 0.5-0.7 mm long. June-August. (Plate XIII, Figure 11, a-d).

Borders of brooks, forest glades, clearings, edges of forests, and coastal sands. -Far East: Kamch., Ze. -Bur., Ud., Ussur., Sakh. Gen. Distr.: Jap. -Chin., N. Am. Described from North America - Carolina.

26. *A. macrothyrsa* Hack. in Fedde, Repert. spec. nov. VII (1909) 318.

Perennial. Culms erect or geniculately ascending at the base, glabrous, 60-65 cm tall; leaves linear, acute, flat, ca. 15 cm long and 6 mm broad, slightly drooping, green, scaberulous on the margin and nerves; ligule ovate, obtuse, ca. 3 mm long, toothed at the apex. Panicle elongate-pyramidal, 30-35 cm long, and 4-8 cm broad, loose, nodding, the branches filiform, obliquely spreading, prominently scabrous, in clusters of 5 below and 2-3 above; pedicels shorter than the spikelets, clavate, scabrous; glumes purple-tinged, markedly unequal, the lower 3 mm long, the upper

2.5 mm, lanceolate, acuminate, scabrous on upper part of the keel; lemma $1/4-1/3$ shorter than the glumes, awnless; palea 0.4 mm long; anthers 0.7 mm long. July.

Forests. - Far East: Sakhalin. Endemic. Described from Sakhalin.

Series 6. Scabridulae Schischk. - glumes scabrous all over the surface.

27. *A. karsensis* Litw. in Sched. ad Herb. Fl. Ross. VIII, Fasc. LIV (1922) 147. - Exs.: HFR No 2692.

Perennial. Rhizome short, giving rise to sterile shoots and erect, slender, smooth culms 40-50 cm tall; leaves linear, flat, 2-12 cm long and 2-3 mm broad, long-acuminate; ligule oblong, ca. 2 mm long, pointed, lacerate. Panicle oblong, contracted, 4-10 cm long and 1.5-4 cm broad, with scabrous branches; glumes purple-tinged, lanceolate, ca. 2 mm long, with short, prickly hairs on the keel, finely scaberulous elsewhere; lemma 1.5 mm long, awnless, scabrous; palea 1 mm long, smooth; anthers ca. 1 mm long. July-August.

Wet, high-mountain meadows, borders of mountain lakes and streams. - Caucasus: East, and South. Transcauc. Gen. Distr.: Turkish Armenia. Described from the neighborhood of the village Kechmaz in former Kars Oblast'. Type in Leningrad.

28. *A. transcaspica* Litw. in Sched. ad Herb. Fl. Ross. VIII (1922) 146. - Exs.: HFR No 2691.

188 Perennial. Rhizome short, roots thin, fibrous; culms tufted, smooth, erect or ascending at the base, 40-70 cm tall; leaves flat, rather scabrous, linear, 5-20 cm long and 2-4 mm broad, finely pointed; ligule oblong on the upper leaves, 3-4 mm long, pointed. Panicle dense, strongly contracted by the end of flowering, branches spikelet-bearing nearly from the base; spikelets light green or light brownish; glumes lanceolate, acute, 2-2.2 mm long, prominently scabrous all over the surface, the lower glume longer than the upper; lemma ca. 1.5 mm long, obtuse, 5-nerved; palea nearly $1/2$ shorter than the lemma; anthers linear, 1 mm long. June-August. (Plate XIII, Figure 2, a-c).

Wet, and dry meadows. - Centr. Asia: Kara-Kum, Upp. Turkm. Endemic. Described from Daine-su. Type in Leningrad.

Subgenus 4. Vilfoidea Rouy, Flore de France XIV (1913) 59. - Lemma and palea alike, $1/2$ as long as the glumes, the latter scaberulous all over the surface, obtuse; perennials.

29. *A. verticillata* Vill. Prosp. Fl. Dauph. (1779) 16; Griseb. in Ldb. Fl. Ross. IV, 438; Shmal'g. Fl. II, 606. - Ic.: Trin. Sp. Gram. I (1828) tab. 36.

Perennial. Rhizome short, roots thin; culms tufted, ascending at the base, smooth, 25-60 cm tall; leaves somewhat stiff, flat, scabrous, 4-10 cm long and 2-6 mm broad, short-acuminate; ligule 3-4 mm long on the upper leaves. Panicle oval or oblong, dense, mostly lobed, 4-10 cm long and 1 cm broad, the divided branches scabrous from the base; glumes pale green, lance-elliptical, obtuse, scabrous on the entire back, approximate after anthesis, 1.5-1.8 mm long, subequal; lemma nearly $1/2$ shorter than the glumes, awnless; palea slightly shorter or as long as the lemma; anthers oval, 0.5 mm long. May-July. (Plate XIII, Figure 15, a-c).

Borders of streams and irrigation canals, wet meadows, coppices, and rice fields. - European part: Crimea; Caucasus: Ciscauc., Dag., East.

Transcauc., Tal.; Centr. Asia: Kyz.-Kum., Kara-Kum., Upp. Turkm., Amu-Dar., Syr-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: Atl. and Centr. Eur., West. and East. Medit., Balk.-As. Min., Iran. Described from the south of France.

ECONOMIC IMPORTANCE. Of medium fodder quality.

Genus 118. GASTRIDIDIUM* P. B.

P. B. Agrost. (1812) 21.

Inflorescence usually a more or less lobed, spike-like panicle. Spikelets 1-flowered, perfect, narrow, lustrous. Glumes swollen, spindle-shaped at the base. Lemmas and palea 1/3 as long as the glumes, glabrous at the base. Stamens 3. Stigmas plumose.

1. *G. lendigerum* (L.) Gaud. Fl. Helv. I (1828) 176. - *Milium lendigerum* L. Sp. pl., ed. 2 (1762) 91. - *Gastridium australe* P. B. Agrost. (1812) 164. - Ic.: Rchb. Ic. Fl. Germ. I tab. 32, fig. 1418. - 189 Exs.: Kneucker, Gram. exs. No 219.

Annual. Culms tufted, 20-50 cm tall, slender, smooth, more or less ascending; leaves linear-lanceolate, flat, to 4 mm broad, scabrous; ligule to 3 mm long. Panicle narrowly oblong, to 10 cm long and 1.5 cm broad, many-flowered; spikelets ca. 3-4 mm long, pale green; glumes long-acuminate, swollen below, glabrous, scabrous on the keel; lemma obtuse, pubescent, the geniculate awn 5-6 mm long, attached at the summit. June-July. (Plate XII, Figure 11, a).

Grassy slopes. - Caucasus: West. and East. Transcauc. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk.-As. Min. Described from southern France. Type in London.

Genus 119. CALAMAGROSTIS** ADANS.

Adans., Fam. II (1763) 31.

Inflorescence paniculate, more rarely spike-like, many-flowered, with prominently scabrous branches. Spikelets 1-flowered, perfect, more or less lanceolate. Rachilla with long hairs at base, [callus hairs], usually prolonged above the floret into a hairy, more or less developed stipe. Lemma with 3-5 nerves, hyaline, awned from the back or from the summit. Palea hyaline, 2-nerved. Stamens 3. Pistils with plumose stigmas. Carpopsis oblong, falling together with the lemma and palea.

1. Glumes linear-subulate, much longer than the lemma and palea; lemma with 3-nerved. (Section 1. *Epigeios* Koch) 2.
- + Glumes lanceolate, acuminate, only slightly longer than the lemma and palea; lemma 5-nerved. (Section 2. *Quinquenerviae* Torges) 5.

* From Greek *gaster* = belly, paunchy vessel.

** Name given by Dioscorides to some grass resembling bentgrass (*Agrostis*), but larger, with roots similar to those of [rattus] cane (*Calamus*).

2. Awn dorsally attached at the middle of the lemma 3.
 + Awn attached at the summit of the lemma 4.
 3. Spikelets 5-7 mm long 1. *C. epigeios* (L.) Roth.
 + Spikelets 10-11 mm long 2. *C. gigantea* Roshev.
 4. Summit of lemma pointed and abruptly terminating in the awn
 3. *C. dubia* Bge.
 + Summit of lemma bilobed, the awn attached between the lobes
 4. *C. glauca* (M.B.) Trin.
 ++ Summit of lemma obtuse, toothed, the awn attached between the teeth
 5. *C. pseudophragmites* (Hall.f.) Koeler.
 5. (1) Rachilla prolonged into a hairy stipe. (Subsection 2. *Deyeuxia*
 (Clar.) Torges) 14.
 190 + Rachilla not prolonged beyond the floret, stipe lacking. (Subsection
 1. *Erudimentosae* Roshev.) 6.
 6. Plant not exceeding 40 cm in height, slender, delicate, resembling in
 general appearance the smaller species of *Agrostis*; Occurring in
 the high-mountain areas of Caucasus and Pam.-Al. 7.
 + Plant from 25 to 100 cm tall, robust, with a very dense, somewhat
 lobed inflorescence; occurring in Pam.-Al. 12.
 ++ Plant from 50 to 150 cm tall, with a spreading or loose panicle, as-
 sociated with the forest zone or the lower mountain zone 13.
 7. Lemma glabrous on the back 8.
 + Lemma pubescent on the back 10.
 8. Glumes lanceolate, 2-3 mm long; anthers linear, 1 mm long
 6. *C. Balansae* Boiss.
 + Glumes ovate or narrowly ovate, 2 mm long; anthers ovoid or short-
 linear, 0.7 mm long 9.
 9. Hairs at the base of the floret [callus hairs] $1/4-1/3$ as long as the
 lemma; palea ovate, $1/2$ as long as the lemma
 7. *C. hissarica* Nevski.
 + Hairs at the base of floret nearly as long as the lemma; palea only
 slightly shorter than the lemma
 8. *C. Ruprechtii* Nevski.
 10. Hairs at the base of floret $1/3$ as long as the lemma
 9. *C. trichantha* Schischk.
 + Hairs at the base of floret scarcely shorter than the lemma 11.
 11. Pedicels very scabrous due to small bristles; anthers ovoid,
 0.35-0.4 mm long 11. *C. olympica* Boiss.
 + Pedicels faintly scaberulous due to small, prickly bristles; anthers
 short-linear, 0.5-0.6 mm long
 10. *C. agrostidiiformis* Roshev.
 12. (6). Lemma toothed at the summit, with awn attached just below the
 summit or somewhat lower and attaining 2 mm in length
 12. *C. turkestanica* Hack.
 + Lemma deeply bidentate, the awn attached about the middle of the back
 and exceeding the lemma by 2 mm
 13. *C. alopecuroides* Roshev.
 ++ Lemma bilobed to $1/3$, the awn attached between the lobes and scarcely
 exceeding the lemma
 14. *C. emodensis* Griseb. var. *breviseta* Hack.
 13. (6). Awn at the summit of the lemma 0.5-1.0 mm long
 15. *C. lanceolata* Roth.

- + Awn at the summit of the lemma 2-2.5 mm long. Occurs in this country only in the Caucasus. 16. *C. persica* Boiss.
14. (5) Rachilla prolonged beyond the floret into a hairy stipe 15.
- + Rachilla prolonged beyond the floret into a small scale with awn as long as the glumes, or merely into a naked awn 17. *C. paradoxa* Lipsky.
15. Inflorescence dense, spikelike; extension of rachilla always very long; plants occurring in the mountains of Central Asia and Altai 16.
- + Inflorescence paniculate or densely paniculate, lobed; only in species of subpolar countries inflorescence subspicate; extension of rachilla short; plants usually not mountainous 20.
16. Spikelet not exceeding 4-5 mm in length; plant confined to Altai 19. *C. macilenta* (Griseb.) Litw.
- + Spikelets 5-11 mm long; plants confined to Central Asia 17.
17. Spikelets 8-11 mm long 20. *C. grandiflora* Hack.
- + Spikelets to 7 mm long 18.
18. Inflorescence ovoid or oblong, 1-4 cm long and 1-2 cm broad, yellowish or rather dark purple 21. *C. anthoxanthoides* (Munro) Rgl.
- + Inflorescence cylindrical, narrow or narrowly oblong 19.
19. Inflorescence pinkish, not brunescent, to 4.5 cm long and 1.5 cm broad 22. *C. laguroides* Rgl.
- + Inflorescence rather dark purple, brunescent, to 6 cm long. 18. *C. tianschanica* Rupr.
20. (15). Callus hairs about as long as the floret, or at least 3/4 as long 21.
- + Callus hairs less than 3/4 as long as the floret 34.
21. Awn to 2.5 mm long, attached between two teeth at the summit of the lemma 26. *C. Poplowskiae* Roshev.
- + Awn attached just below the incision between the teeth 22.
- ++ Awn attached on the back of the lemma 23.
22. Awn short, slightly exceeding the teeth; occurring in the European part of USSR and in West. Siberia 15. *C. lanceolata* Roth.
- + Awn ca. 5 mm long. Mountain regions of Central Asia. 29. *C. Alexeenkoana* Litw.
23. Awn dorsally attached on the upper 1/3 of the lemma 24.
- + Awn dorsally attached at the middle or on the lower 1/3 of the lemma 27.
24. Spikelets large, 6-7.5 mm long; callus hairs longer than the floret 23. *C. flexuosa* Rupr.
- + Spikelets smaller, 4-5 mm long; callus hairs somewhat longer than the floret 25.
- 192 25. Panicle dense, contracted, somewhat lobed; plant occurring only in Central Asia, in mountains (Pam.-Al.) 28. *C. Korshinskyi* Litw.
- + Panicle not contracted, rather open; plants occurring in the European part of the USSR and in Siberia. 26.
26. Leaves narrow, to 3 mm broad; ligule 2-3 mm long; lemma deeply bifid at the summit 25. *C. vilnensis* Bess.
- + Leaves to 7 mm broad; ligule 4-7 mm long; lemma bidentate at the summit 24. *C. elata* Blytt.

- ++ Leaves to 10 mm broad; ligule to 10 mm long; lemma obtuse or with small teeth at the summit 31. *C. Langsdorffii* Trin. var. *notabilis* Litw.
27. (23). Awn dorsally attached on the middle 1/3 of the lemma ... 28.
- + Awn dorsally attached on the lower 1/3 of the lemma 33.
28. Awn straight or bent, but not twisted below 29.
- + Awn weakly geniculate, twisted below 30. *C. schugnanica* Litw.
29. Spikelets large, 6-8 mm long; culms undivided 32. *C. uralensis* Litw.
- + Spikelets 3.5-6 (rarely 6.5) mm long; culms branching 30.
- ++ Spikelets ca. 2.5 mm long; culms undivided 40. *C. czukezorum* Soezawa.
30. Leaves 2-3 mm broad, often folded, Panicle to 13 cm long, delicate 34. *C. angustifolia* Kom.
- + Leaves 5-10 mm broad 31.
31. Plant not exceeding 80 cm in height; glumes hirtellous; the entire plant dark-colored 35. *C. fusca* Kom.
- + Plant from 80 to 150 cm tall, not dark; glumes glabrescent ... 32.
32. Culm stout, branching at the base, with 3-4 nodes and same number of culm leaves; spikelets large, ca. 6.5 mm long; plant spreading 33. *C. teberdensis* Litw.
- + Culm slender, branching from the middle and lower nodes; nodes 4-6; spikelets 3.5-5 mm long, rarely attaining 6 mm in length; a plant of the forest zone of USSR 31. *C. Langsdorffii* (Link) Trin.
33. (27). Awn nearly 1 1/2 times as long as the lemma; a plant associated with the mountains of Central Asia 27. *C. alajica* Litw.
- + Awn scarcely reaching the summit of lemma, bent below 44. *C. lapponica* (Wahlbg.) Hartm.
34. (20). Awn attached on the upper 1/3 of the lemma 35.
- + Awn attached at the middle of the lemma or lower down 36.
- 193 35. Callus hairs shorter than 1/2 the length of the floret 39. *C. Steinbergii* Roshev.
- + Callus hairs exceeding 1/2 the length of the floret 38. *C. Holmii* Lange.
36. Awn straight or bent, but not geniculate 37.
- + Awn always distinctly geniculate, strongly twisted below 46.
37. Spikelets large, 5.5-7 mm long 38.
- + Spikelets to 5 mm long 39.
38. Glumes narrowly lanceolate; callus hairs 1.5-2 mm long; a Far Eastern plant 49. *C. aleutica* Trin.
- + Glumes lanceolate; callus hairs 2-4 mm long; a Central Asiatic plant 47. *C. Pavlovii* Roshev.
39. Awn quite straight 40.
- + Awn more or less bent, often exerted from the side of the spikelet 41.
40. A low plant, to 30 cm in height, associated with the arctic tundra 37. *C. groenlandica* (Schrud.) Kunth.
- + A taller plant, 50-100 cm, associated with boggy sites in the forest zone 36. *C. neglecta* (Ehrh.) P. B.

41. A low plant, from 15 to 50 cm in height, associated with the arctic tundra 42.
 + A taller plant, from 50 to 130 cm in height, associated with the forest zone 44.
 42. Lemma 4-toothed at the summit. Panicle contracted, subspicate ... 41. *C. Bungeana* V. Petr.
 + Lemma bidentate at the summit. Panicle loose, more rarely dense 43.
 43. Ligule ca. 5 mm long; awn not exceeding the lemma 42. *C. kolymaensis* Kom.
 + Ligule ca. 1.5 mm long; awn slightly longer than the lemma 43. *C. deschampsoides* Trin.
 44. (41). Ligule short, obsolete on the uppermost leaf; spikelets ca. 5 mm long; awn dorsally attached just below the middle of the lemma 48. *C. sachalinensis* F. Schm.
 + Ligule 3-5 mm long. Spikelets 3-4 mm long. Awn attached close to the base of the lemma 45.
 45. Callus hairs slightly exceeding 1/2 the length of the floret; awn not exerted 46. *C. chalybaea* (Laest.) Fr.
 + Callus hairs not exceeding 1/2 the length of the floret; awn always exerted from the side of the spikelet 45. *C. obtusata* Trin.
 46. (36). Callus hairs 1/2 as long as the floret 53.
 194 + Callus hairs 1/4-1/3 as long as the floret, rarely some of the hairs attain half the length of the lemma 47.
 47. Callus hairs not exceeding 1/4 the length of the floret 48.
 + Callus hairs reaching 1/3-1/2 the length of the floret 51.
 48. Panicle few-flowered, loose, ca. 4 cm long; a Far Eastern plant ... 54. *C. monticola* V. Petr.
 + Panicle many-flowered, usually from 6 to 20 cm long 49.
 49. Plant to 50 cm tall, associated with the stony tundra of Siberia and Far East 55. *C. purpurascens* R. Br.
 + Plant from 60 to 125 cm tall 50.
 50. Panicle 8-10 cm long, broadly cylindrical, spikelike 56. *C. wiluica* Litw.
 + Panicle narrowly lanceolate, contracted, to 20 cm long 50. *C. arundinacea* (L.) Roth.
 51. Spikelets to 7 mm long; lemma 5-5.5 mm long 55. *C. Korotkyi* Litw.
 + Spikelets not exceeding 6 mm in length. Lemma ca. 4 mm long ... 52.
 52. Plant from 60 to 100 cm tall; leaves of sterile shoots narrow, more or less folded 51. *C. brachytricha* Steud.
 + Plant from 50 to 80 cm tall. Leaves of sterile shoots flat, to 1 cm broad 52. *C. Turczaninowi* Litw.
 53. (46). A tall plant, 70-100 cm in height. Panicle lanceolate, narrow, contracted, to 20 cm long. Occurring only in the Volg.-Kam. region 57. *C. Andrejewi* Litw.
 + Plants not exceeding 70 cm in height. Panicle up to 10 cm long. Occurring only in the Caucasus 54.
 54. Palea shorter than the lemma; awn longer than the floret 58. *C. caucasica* Trin.
 + Palea markedly longer than the lemma; awn scarcely exceeding the floret 59. *C. iberica* (Griseb.) Litw.

Section 1. *Epigeios* Koch, Syn., ed. I (1873) 783. - *Trinerviae* Torges, Mitth. Thur. Bot. Ver. Neue Folge, XII (1899) 23. - Glumes linear-subulate; lemma 3-nerved.

1. *C. epigeios* (L.) Roth, Tent. Fl. Germ. I (1788) 34; Griseb. in Ldb. Fl. Ross. IV, 432; Shmal'g. Fl. II, 609; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 224. - *Arundo epigeios* L. Sp. pl. (1753) 81. - *C. macrolepis* Litw. in Not. Syst. Herb. Horti Bot. Petrop. II (1921) 125*. - *loc.*: Rchb. Ic. Fl. Germ. I tab. 43, f. 1453. - Exs: HFR No 1099.

195 Perennial. Rhizome creeping; culms 80-150 cm tall; leaves broadly linear, glaucous-green; ligule linear, to 9 mm long; leaf sheaths scabrous, glabrous, more rarely hairy, sometimes glaucous (var. *glauca* Blytt.). Panicle to 30 cm long, erect, dense, lobed, more rarely narrow, sublinear (var. *tenuifolia* Trin.), with spikelets crowded in clusters and hispidulous branches; spikelets linear-lanceolate, 5-7 mm long, green (var. *macra* Trin.) or more or less purplish (f. *variegata* Schur); glumes linear-subulate, scabrous on the keel; lemma nearly 1/2 shorter than the glumes, the straight awn dorsally attached at its middle; callus hairs nearly twice as long as the lemma. June-August. (Plate XIV, Figure 1, a-c).

Everywhere on sandy soil. - European part; all regions; West. Siberia: all regions; East. Siberia: all regions; Far East: Ze. - Bur., Ussur., Sakh.; Centr. Asia: all regions. Gen. Distr.: Scand., Central and Atl. Eur., Medit., Balk. - As. Min., Arm. - Kurd., Iran, Ind. - Him., Dzung. - Kashg., Mong., Jap. - Chin. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Grazed in pasture only before heading. Furnishes coarse hay, but in flood meadows of the forest zone it is of moderate quality. The straw is used for mats, thatches, and for litter.

2. *C. gigantea* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 294. - *Calamagrostis epigeios* var. *gigantea* Roshev. in sched.

Perennial. Culms 150-180 cm tall, erect, glabrous, leafy; leaves linear, long-acuminate, to 8 mm broad and 40 cm long, flat and somewhat inrolled at the margins, rather scabrous; ligule 5-8 mm long. Panicle dense, lobed, narrowly fusiform, 18-22 cm long and 3-4 cm broad, green or slightly purplish, the branches hispid to 3 cm long; spikelets ca. 11 mm long, long-acuminate; glumes narrowly lanceolate-subulate, long-acuminate, unequal, 8-11 mm long, scabrous on the keel; lemma ca. 4.5 mm long, the awn straight, ca. 3 mm long, attached at the middle of the back and scarcely longer than the lemma; rachilla not prolonged beyond the spikelet; callus hairs nearly twice as long as the lemma, to 7-9 mm; anthers ca. 2.5 mm long. July (Plate XIV, Figure 2, a, b).

Borders of reservoirs. - Central Asia: Pribalkh. Endemic. Described from the borders of Alakul' Lake, near Kzyl-agach. Type in Leningrad.

3. *C. dubia* Bge. Reliq. Lehm. (1847) 348 non Czetz. in Linnaea XXX (1859) 618. - *Calamagrostis pseudophragmites* var. *dubia* Hack. in herbar.

Perennial. Rhizome creeping; culms 70-200 cm tall, culms and leaf sheaths smooth or scaberulous; leaves linear, to 6 mm broad, often folded; ligule to 8 mm long, sometimes hirtellous on the outside (var. *hirta* Litw.).

* This refers to specimens attacked by nematodes of the genus *Tylenchus* (according to determination of V. Tramshe!).

Panicle 10-30 cm long, dense, with scabrous branches; spikelets whitish-
196 green, becoming yellow or brown; glumes unequal, acuminate, the lower
ca. 6 mm long, the upper 1/4-1/3 shorter; lemma 1/2-2/3 as long as the
glumes, the awn straight, 1 1/2-3 mm long, forming a direct extension of
the pointed summit; callus hairs twice as long as the lemma; hairy ex-
tension of rachilla absent. June-September. (Plate XIV, Figure 3, a, b).

Border of streams. -Centr. Asia: Pribalkh., Dzung. -Tarb., Kyz. -
Kum., Kara-Kum., Upp. Turkmen., Amu-Dar., Tyan'-Shan. Endemic. De-
scribed from the road between Bukhara and Samarkand. Type in Paris.

4. *C. glauca* (M.B.) Trin. in Hohen. Enum. pl. prov. Talysh (1837)
14. -*Arundo glauca* M.B. Fl. taur.-cauc. I (1808) 79. -*A. laxa* Roem.
et Schult. Syst. veg. II (1817) 502. -*Calamagrostis laxa* Host. Gram.
austr. IV (1809) 25, tab. 43. -Exs.: HFR No 2185, 2186.

Perennial. Rhizome creeping; culms 50-100 cm tall, culms and leaf
sheaths smooth; leaves linear, 2-3 mm broad, more or less involute (var.
angustifolia M.B.) or to 10 mm broad, flat (var. *latifolia* M.B.).
Panicle 12-22 cm long, dense with very scabrous branches. Spikelets
brownish-purple or yellowish, ca. 6-7 mm long; glumes lanceolate-subu-
late, finely pointed, the lower somewhat longer than the upper; lemma
1/2-2/3 as long as the glumes, awned from the incision at the summit, the
awn straight, ca. 2 mm long. Callus hairs 1 1/2 times as long as the lem-
ma. There is no hairy extension of the rachilla. June-July. (Plate XIV,
Figure 4, a, b).

Coastal sands. -European part: Lower Don. (Krasnoarmeisk, Saratov),
Low. Volg.; Caucasus; all regions except Tal., Centr. Asia: Aral. -Casp.;
Syr-Dar., Pam. -Al. Gen. Distr.: Centr. and Atl. Eur., Medit., Arm. -
Kurd., Iran. Described from the Caucasus. Type in Leningrad.

5. *C. pseudophragmites* (Hall. f.) Koeler, Descr. Gram. (1802)
106; Kryl. Fl. Zap. Sib. (Fl. West. Sib) II, 226. -*Arundo pseudo-*
phragmites Hall. f. in Roem. Arch. I, 2 (1796) 11. -*A. litorea*
Schrud. Fl. germ. I (1806) 212, tab. 4, f. 2. -*Calamagrostis laxa*
Host, Gram. austr. IV (1809) 25, tab. 43; Griseb. in Ldb. Fl. Ross. IV,
432. -*C. litorea* DC. Fl. fr. V (1815) 255; Shmal'g. Fl. II, 609. -
C. Onoei Franch. et Sav. Enum. pl. Jap. II (1879) 598. -*lc.*: Rchb. *lc.*
Fl. Germ. I, tab. 42, fig. 1450. -Exs.: HFR, No 2195.

Perennial. Rhizome creeping; culms 50-100 cm tall; leaf sheaths
glabrous; leaves linear, to 6 mm broad, often folded; ligule to 8 mm long,
obtuse or cleft. Panicle 15-25 cm long, dense, with prominently scabrous
branches; spikelets narrowly lanceolate, brownish-purple, brownish-straw-
colored after anthesis; glumes unequal, the lower 5-8 mm long, the upper
1/4 to 1/3 shorter, lanceolate-subulate, finely pointed; lemma 1/3-1/2 as
long as the lemma; there is no hairy extension of the rachilla. June-July.
(Plate XIV, Figure 5, a, b).

197 Sandy river banks. -European part: Low. Don., Low. Volg.; Caucasus:
Ciscauc., Dag., East. and South. Transcauc., West. Siberia: Irt., Alt.;
East. Siberia: Ang. -Sayan., Daur.; Far East: Ussur.; Centr. Asia: all re-
gions. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk. -As. Min., Arm. -
Kurd., Iran, Ind. -Him., Dzung. -Kashg., Mongolia. Described from
Switzerland. Type in Geneva.

Section 2. *Quinquenerviae* Torges, Mitth. Thür. Bot. Ver. Neue
Folge XII (1899) 23. -Glumes lanceolate, pointed. Lemma 5-nerved (in
species with basal awn 4-nerved).

Subsection 1. *Erudimentosae* Roshev. - Rachilla not extending beyond the floret.

Series 1. *Agrostidiformes* Roshev. - Genus proprium: *Pentanthrum* Nabelek in Publ. Fac. Sc. Univ. Masaryk, Brno, No 111 (1929) 8. - Rudiment of second floret lacking or obsolete. Spikelets small, ca. 2-3 mm. Plants resembling bentgrass - *Agrostis*. High-mountain regions of Caucasus and Central Asia.

6. *C. Balansae* Boiss. Fl. Or. V (1884) 522. - *Agrostis lazica* Ball. in Bull. Soc. Bot. Fr. XXI (1874) 12 ex parte. - V. Balansy.

Perennial. Tufted; roots fibrous, culms 20-40 cm tall, undivided, slender, glabrous; leaves narrowly linear, long-acuminate, flat, to 3 mm broad, scaberulous; ligule up 3-4 mm long, serrate. Panicle narrow, contracted, often somewhat nodding at the top; spikelets ca. 2.5-3 mm long, lanceolate, rather dark purple; glumes lanceolate, pointed, subequal, scabrous on the keel; lemma lanceolate, toothed at the summit, the geniculate awn slightly twisted below, attached dorsally at the base or just above it and slightly longer than the lemma; callus hairs arranged on two sides of the floret, rather copious, 1/3 as long as the lemma; palea short or lacking; extension of rachilla lacking; July-August. (Plate XIV, Figure 6, a, b).

Alpine meadows. - Caucasus: Ciscauc. (Mountainous part), West. and East. Transcauc. Gen. Distr.: Arm. - Kurd. Described from Asia Minor. Type in Geneva.

7. *C. hissarica* Nevski sp. nov. in Addenda p. 747. - *Pentanthrum hissaricum* Nevski in sched.

Perennial. Forming compact tufts; culms 15-40 cm tall, undivided, glabrous, black at the nodes; leaves narrowly linear, to 1.5 mm broad, green, glabrous; ligule 0.7-1.5 mm long, obtuse sometimes bifid, ciliate at the apex. Panicle erect, 3.8 cm long, narrow, contracted after anthesis, with slender branches; spikelets borne on very scabrous pedicels, ca. 2 mm long; glumes ovate, of equal length, dark purple, prominently scabrous-hirtellous on upper part of the keel; lemma ovate, naked, with 5 nerves of which the two marginal ones are prolonged at the summit into minute awns 0.15-0.2 mm long, and with a dorsal awn attached below the middle; awn somewhat flexuous, scabrous, nearly twice as long as the lemma; palea ovate, ca. 1 mm long, half as long as the lemma; callus hairs attaining 1/4-1/3 the length of the floret; anthers ca. 0.7 mm long; extension of rachilla lacking. September. (Plate XIV, Figure 7, a, b).

Damp alpine meadows. - Centr. Asia: Pam. - Al. Endemic. Described from Gissar Range, Ak-tash Pass, 3,000 m, 28 September 1933, No 75. Grigor'ev, Yu., Koroleva, A., and Nikitin, V. Type in Leningrad.

8. *C. Ruprechtii* Nevski sp. nov. in Addenda p. 748. - *Pentatherum Ruprechtii* Nevski in sched. - V. Ruprekhta.

Perennial. Forming compact tufts - culm 17-18 cm tall, undivided, slender, glabrous; leaves linear, up to 1.75 mm broad, green, scabrous; ligule 1-2.5 mm long, obtuse, cleft, ciliate. Panicle erect, 1.5-7 cm long, contracted after anthesis, the branches slender, very scabrous - spikelets borne on very scabrous pedicels, 2 mm long; glumes ovate, equal, dark purple, hispidulous-scabrous on upper part of the keel; lemma ovate, glabrous, scabrous, toothed at summit, with 5 nerves of which the two marginal ones are prolonged into minute awns 0.25-0.4 mm long, the dorsal awn attached somewhat below the middle, straight or somewhat flexuous, scabrous, nearly

twice as long as the lemma; callus hairs only slightly shorter than the floret; anthers ca. 0.4 mm long. July.

Alpine meadows. -Caucasus: Dagestan. Endemic. Described from southern Dagestan, from the sources of Dzshultu-chai, alt. 1,400-1,430 m. 18 July 1860. Ruprecht. Type in Leningrad.

9. *C. trichantha* Schischk. sp. nov. in Addenda p. 748. -*Pentatherum trichanthum* Schischk. in sched.

Perennial. Tufted; roots fibrous; culms erect, 8-17 cm tall, slender, surrounded at the base by radical leaves; leaves narrowly linear, 0.5-2.5 mm broad and 2-4 cm long, flat, acuminate, scabrous; ligule oblong, 1.5-2 mm long, often cleft. Panicle narrow, contracted, 2-4.5 cm long and 0.5-1 cm broad, with short, scabrous branches; spikelets lanceolate, dark purple; glumes subequal, pointed, ca. 2 mm long, prominently scabrous on the keel toward the summit; lemma to 1.5 mm long, with long scant hairs on the back, bearing 3 short, bristles (nerve extensions) at the summit, the bent awn, to 2 mm long, attached below the middle of the back; callus hairs about half as long as the floret; lemma ca. 1 mm long. August. (Plate XIV, Figure 8, a, b).

Mountain meadows. -Caucasus: Southern Transcaucasia. Endemic. Described from Armenia, Novo-Bayaet. region of Mount Arkhazin, 5 August 1929. O. Zedel'meyer. Type in Leningrad.

10. *C. agrostidiformis* Roshev. in Not. Syst. Herb. Horti Bot. Petrop. III (1922) 200.

Perennial. Forming loose tufts; rhizome creeping; culm 20-25 cm tall, smooth, leafless above; leaves narrowly linear, to 2 mm broad, scabrous on the upper surface; ligule 1-2 mm long. Panicle narrow, contracted, 2-5 cm long and to 7 mm broad, the branches prominently scabrous, to 2 cm long; spikelets ca. 2 mm long, purplish; glumes narrowly lanceolate, ciliate on the keel, subequal; lemma broadly lanceolate, hairy, toothed at the summit, with two lateral nerves prolonged into minute awns, the dorsal awn attached slightly below the middle, straight, exceeding the lemma by 1/2 the length; callus hairs nearly as long as the lemma. Extension of rachilla lacking.

Centr. Asia: Pam. -Al. Endemic. Described from Uzbekistan (slopes of the Otuz-art River gorge, below the Taldy-bel' Pass, along mountain streams). Type in Leningrad.

11. *C. olympica* Boiss. Diagn. ser. 1, V (1844) 70. -*C. buschiana* Litw. in Journ. Soc. Bot. Russ. XI (1926) 229. -*Pentatherum olympicum* Nabelek in Publ. Fac. Sc. Univ. Masaryk, Brno, No 111 (1929) 9.

Explanation to Plate XIV

1. *Calamagrostis epigeios* (L.) Roth.: a) lemma; b) glumes; c) inflorescence. -2. *C. gigantea* Roshev.: a) lemma; b) glumes. -3. *C. dubia* Bge.: a) lemma; b) glumes. -4. *C. glauca* (M.B.) Trin.: lemma; b) glumes. -5. *C. pseudophragmites* (Hall. f.) Koeler.: a) lemma; b) glumes. -6. *C. Balansea* Boiss.: a) lemma; b) glumes. -7. *C. hissarica* Nevski.: a) lemma; b) glumes. -8. *C. trichantha* Schischk.: a) lemma; b) glumes; c) inflorescence. -9. *C. olympica* Boiss.: a) lemma; a') summit of lemma. -10. *C. turkestanica* Hack.: a) lemma; b) glumes; c) inflorescence. -11. *C. aloppecuroides* Roshev.: a) lemma; b) glumes. -12. *C. lanceolata* Roth.: a) lemma; b) glumes; c) inflorescence. -13. *C. persica* Boiss.: a) lemma; b) glumes. -14. *C. paradoxa* Lipsky.: a) lemma; b) glumes. -15. *C. tianschanica* Rupr.: a) lemma; b) glumes; c) inflorescence. -16. *C. macilentia* (Griseb.) Litw.: a) lemma; b) glumes; a') extension of rachilla. -17. *C. grandiflora* Hack.: a) lemma; b) glumes. -18. *C. anthoxanthoides* (Munro) Rgl.: a) lemma; a') extension of rachilla; c) inflorescence; d) glumes.



Perennial. Forming compact tufts, with numerous, thin roots; culm 10-20 (-30) cm tall, glabrous, leafy up to the middle; leaves narrowly linear, flat, to 1.5 mm broad, scabrous on the upper surface; ligule ca. 1.2 mm long. Panicle narrow, sublinear, contracted, 2-5 cm long, the branches prominently scabrous, to 2.3 cm long; spikelets ca. 2 mm long, lanceolate, rather dark purple; glumes ovate-lanceolate, acuminate, subequal, ciliate on the keel; lemma ca. 1.75 mm long, ovate, pilose, toothed at the summit, awned from slightly below the middle, awn straight, nearly twice as long as the lemma; callus hairs as long as the floret; extension of rachilla lacking. August. (Plate XIV, Figure 9, a, a').

- 202 Boggy sites in the alpine zone. -Caucasus: Western Transcaucasia. Described from Greece. Type in Geneva.

Subsection 2. *Deyeuxia* (Clar.) Torges, Mitth. Thur. Bot. Ver. Neue Folge XII (1899) 23; Clarion in P. B. Agrost. (1812) 43 sub gen. -Rachilla prolonged beyond the floret into a hairy, fairly well developed stipe.

Series 2. *Turkestanicae* Roshev. -Plants from 25 to 100 cm tall, with a very dense, somewhat lobed panicle, occurring only in Pam. -Alai.

12. *C. turkestanica* Hack. in A. H. P. XXVI (1906) 59. -Fedg. Rast. Turk. (Plants of Turkistan) (1915) 103, fig. 62.

Perennial. Tufted; rhizome creeping; culm 30-65 cm tall, erect, stout, undivided, glabrous, with numerous sheaths of radical leaves at the base; leaves linear, long-acuminate, stiff, flat, to 5 mm broad, glaucous, scabrous; ligule ca. 4 mm long. Panicle oblong, contracted, dense, more or less lobed, to 12 cm long and 2-3 cm broad; spikelets linear-lanceolate, ca. 6 mm long, yellowish or brownish; glumes narrowly lanceolate, long-acuminate, subequal, scabrous on the keel; lemma 3.5-4 mm long, lanceolate, toothed at the summit, the straight awn from just below the summit or somewhat lower down, attaining 2 mm in length; callus hairs copious, as long as the lemma; palea $3/4$, more rarely less than $1/2$ as long as lemma (var. *brevipalea* Litw.). Extension of rachilla lacking. July-September. (Plate XIV, Figure 10, 1, b, c).

Banks of mountain streams. -Centr. Asia: Pam. -Al. Endemic. Described from Trans-Alai Chain, northern side of Ters-agar Pass. 21 September 1878. Nevesskii. Type in Leningrad.

13. *C. alopecuroides* Roshev. in Not. syst. Herb. Hori Bot. Petrop. III (1922) 199.

Perennial. Culm 25-35 cm tall, glabrous, leafy, with numerous sheaths of radical leaves at base; leaves linear, long-acuminate, to 5 mm broad and 13 cm long, glabrous, very scabrous; ligule 3-5 mm long. Panicle dense, cylindrical, contracted, the short, prominently scabrous branches, 7-8 cm long and to 2 cm broad; spikelets ca. 7 mm long, purplish; glumes narrowly lanceolate, long-acuminate, prominently scabrous on the keel, subequal; lemma lanceolate, deeply bidentate, the straight awn attached about the middle and 2 mm longer than the lemma; callus hairs copious, about as long as the lemma; extension of rachilla lacking. (Plate XIV, Figure 11, a, b).

Centr. Asia: Pam. -Al. Endemic. Described from Fergana Range, below Dzhitym Pass. 28 July 1903. V. Lipskii. Type in Leningrad.

14. *C. emodensis* Griseb. var. *brevisetia* Hack. ex Paulsen in Kjoeb. Vidensk. Meddel. (1903) 167. -V. *gimalaiskii* [Himalayan].

203 Perennial. Rhizome creeping; culm to 1 mm tall, smooth; leaves broadly linear, scabrous; ligule elongate, cleft. Panicle nodding, dense, narrow, to 30 cm long; spikelets ca. 6 mm long, crowded; glumes narrowly linear, subulate-acuminate; lemma bilobed 2/3 of its length, the awn attached between the lobes and scarcely exceeding them; callus hairs much longer than the floret; hairy extension of rachilla lacking.

Centr. Asia: Pam. -Al. Gen. Distr.: Himalayas, Kashmir. Described from Pamir, Vakhani, in thickets near Sermut. Alt. 2,900 m. 21 September 1898, O. Paulsen. Type in Leningrad.

NOTE. Neither the species nor the variety are available in Leningrad. The description has been compiled from the original description of Griseb. (in Goett. Nachricht. (1868) 80) with modifications referring to var. *brevisetia* Hack. (l.c.).

Series 3. *Lanceolatae* Roshev. -Plant 50-100 cm tall with an open or loose panicle. Awned from the upper part of the lemma. Occurring in the forest zone and in the lower mountain zone.

15. *C. lanceolata* Roth, Tent. Fl. germ. I (1788) 34; Griseb. in Ldb. Fl. Ross. IV, 431; Shmal'g. Fl. II, 610; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 223. -*C. calamagrostis* Karst. Fl. Deutschl. 2 Aufl. I (1895) 383; asch. et Gr. Syn. II (1899) 200. -*C. lithuanica* Besser in Roem. et Schult. Add. ad Mant. II (1827) 602. -*l.c.*: Rechb. l.c. Fl. Germ. I, tab. 41, fig. 1448. -*Exs.*: HFR No 2187.

Perennial. Rhizome branching; culms 60-130 cm tall, slender, branching, culms and leaf sheaths-smooth or scabrous above; leaves linear, long-acuminate, to 5 mm broad, rather scabrous; ligule short. Panicle rather loose, often nodding 10-15 cm long, with scabrous branches, dark purple or, more rarely, pale-colored (var. *pallida* Lange); spikelets 4-5 mm long, more rarely 3-4 mm (var. *parviflora* Harz) or 5-6 mm (var. *grandiflora* Harz); glumes lanceolate, subequal; lemma broadly lanceolate, with two teeth at the summit and a short awn (0.5-1.0 mm) attached between them; rarely awn attached slightly below the interdental incision (var. *hypocrathera* Torges); rachilla hairs slightly longer than the lemma; hairy extension of rachilla lacking, more rarely present as an obsolete, minute, pallid rudiment with few hairs (var. *rudimentigera* Litw.). June-July. (Plates XIV, Figure 12, a, b, c, and XV, Figure 4, a, b).

Flood-land and boggy meadows-Arctic: Arct. Eur. (Kanin); European part: all regions; Caucasus: Ciscauc. (Stavropol'), East. Transcauc. (?); West. Siberia: Ob. region (south.), Upp. Tob., Irt., Alt. Gen. Distr.: Scand., Centr. and Atl. Eur., Medit. (northern part), Balk. -Asia Min. (?). Described from Germany. Type in Oldenburg.

ECONOMIC IMPORTANCE. A grass yielding hay of medium quality, of greater value than hay obtained from *C. epigeios*.

204 *C. lanceolata* Roth. $\times$ *Langsdorffii* Trin. ex Litw. in Sched. Herb. Fl. Ross. VIII (1922) 166. -*Exs.*: HFR No 2725.

Perennial. Rhizome short-creeping; culms branching, 75-100 cm tall; leaves linear, long-acuminate, scabrous. Panicle 10-15 cm long, often green, open; spikelets ca. 5 mm long; glumes lanceolate, long-acuminate, scabrous; lemma ca. 3.5 mm long, the straight awn attached between the middle and the summit, rarely exceeding the lemma; callus hairs ca. 4 mm long; hairy extension of rachilla rather well developed. June-July.

European part: Kar. -Lap., Upp. Dnep. Described from Western Region, Bel'sk County. Bank of a forest brook near the railroad station Zemtzy.

16. *C. persica* Boiss. Diagn. ser. 1, VII (1846) 120; Griseb. in Ldb. Fl. Ross. IV, 432. -*C. rubella* Boiss. nomen nudum in sched. - *C. lanceolata* var. *armena* C. Koch. in Linnaea XXI (1848) 387. - *C. litorea* var. *persica* Boiss. Fl. Or. V (1884) 525. -*C. pseudo-phragmites* var. *armena* Litw. in sched.

Perennial. Rhizome creeping; culms 50-100 cm tall, erect, glabrous; leaves linear, long-acuminate, to 4 mm broad and 40 cm long, rather flat, scabrous, ligule to 5 mm long, oblong. Panicle contracted, oblong-lanceolate, 9-14 cm long, with branches to 7 cm long; spikelets 3.5-4 mm long, purplish, turning yellow; glumes narrowly lanceolate, subequal; lemma lanceolate, ca. 2.5 mm long, short-bidentate at the summit, the straight awn from between the teeth attaining 2 mm in length. Callus hairs ca. 2.5-3 mm long; extension of rachilla lacking. July. (Plate XIV, Figure 13, a, b).

Wet mountain slopes and borders of mountain streams. -Caucasus: South. Transcauc. Gen. Distr.: Iran. Described from Ku-Daena Mountains in southern Persia. Type in Geneva.

Series 4. *Paradoxa* Roshev. -Rudiment of a second floret in the shape of an awned bract or merely a well developed awn. In the mountains of Caucasus.

17. *C. paradoxa* Lipsky in A. H. P. XIII (1894) 356.

Perennial. Culm ca. 60 cm tall, firm, scabrous; leaves and their sheaths scabrous; ligule ca. 4 mm long. Panicle ca. 17 cm long, narrow, contracted, the short, prominently scabrous branches to 4 cm long; spikelets 6-7 mm long, narrowly lanceolate, dingy-purple; glumes narrowly lanceolate, long-acuminate, subequal; lemma 2/3 as long as the glumes, bidentate at the summit, with a straight awn from the middle of the back or slightly below it; callus hairs somewhat shorter than the lemma or nearly as long; rudiment of second floret (extension of rachilla) well developed and consisting of a small bract with awn as long as the glumes, or merely a naked awn. (Plate XIV, Figure 14, a, b).

205 Stony places and mountains. -Caucasus: Ciscaucasia, Dagestan. Endemic. Described from Nal'chik. region, Bezengi Glacier. 25 July 1892. V. Lipskii. Type in Leningrad.

Series 5. *Tianschanica* Roshev. -Panicle dense, spikelike. Extension of rachilla always very long. Mountain regions of Central Asia and Altai.

18. *C. tianschanica* Rupr. in Osten-Sacken et Rupr. Sert. tiansch. (1869) 34. -*C. compacta* Hack. ex Paulsen in Kjoeb. Vidensk. Meddel. (1903) 167. -*Deyeuxia compacta* Munro in Hook. Fl. of Br. Ind. VII (1897) 267. -*Avena sesquiflora* Rgl. in A. H. P. VII (1880) 636 (non Griseb.). -*Calamagrostis arundinacea* var. *pamirica* Hook. in sched. -*C. pamirica* Litw. in Not. Syst. Herb. Horti Bot. Petrop. II (1921) 121.

Perennial. Tufted; rhizome creeping; culms 15-30 cm tall, unbranched, glabrous; leaves narrowly linear, to 3 mm broad, rather involute, more rarely flat, scabrous on the upper surface; ligule ca. 2-3 mm long, obtuse. Panicle narrow, contracted, to 6 cm long, spikelike, purplish, more rarely

pinkish, turning brown; spikelets 5-6.5 (-7) mm long, more rarely 3-4 mm (var. *parviflora* Litw.), lanceolate, short-pediceled; glumes lanceolate, acuminate, subequal, the lower 1-nerved, the upper 3-nerved; lemma lanceolate, serrate at the summit, awned from the middle or just below it, the awn geniculate, somewhat twisted below, 1/6 longer than the lemma. Callus hairs ca. 2 mm long; extension of rachilla up to 2 1/2 mm long, with hairs to 4 mm long. July-August. (Plate XIV, Figure 15, a-c).

Alpine meadows and mountain slopes, more rarely alpine solonchets soils. - Centr. Asia: Pam. -Al., Tyan'-Shan. Gen. Distr.: Ind. -Him., Dzung. -Kashg. Described from Tyan'-Shan (Chatyrkul), 26 July, 1867. F. Osten-Sacken). Type in Leningrad.

19. *C. macilenta* (Griseb.) Litw. in Not. syst. Herb. Horti Bot. Petrop. II (1921) 119; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 216. -*C. varia* var. *macilentissima* Trin. in Ldb. Fl. Alt. I (1829) 88 nomen nudum. -*C. varia* ? *macilenta* Griseb. in Ldb. Fl. Ross. IV (1853) 427. -*C. anthoxanthoides* var. *altaica* Kryl. Fl. Alt. VII (1914) 1596 p.p.

Perennial. Tufted; rhizomes creeping; culms 15-40 (-60) cm tall, slender, unbranched, glabrous; leaves involute, more rarely flat, 1-3 mm broad, scabrous, those of the culm shorter than those of the innovations; ligule 0.5-5 mm long. Panicle spikelike, strongly contracted, dense, sometimes somewhat lobed, 3-7 cm long and to 1.5 cm broad; spikelets lanceolate, more or less tinged; glumes 4-5 mm long, subequal; lemma 3-4 mm long, awned from the lower one-fourth, the awn geniculate, twisted below, usually exceeding the lemma by 1 mm, rarely of same length; callus hairs 1/3-1/2 as long as the floret; hairy extension of rachilla very long, 1.5-2 mm, the hairs, as long as the spikelet. June-July. (Plate XIV, Figure 16 a, a', b).

- 206 Mountain valleys, in solonchets meadows, and lower part of alpine zone. - West. Siberia: Alt. Endemic. Described from meadows along Charysh River. Type in Leningrad.

ECONOMIC IMPORTANCE. A good pasture plant for horses.

20. *C. grandiflora* Hack. in A. H. P. XXVIII (1912) 76 (nomen). Description in Acta Inst. Bot. Acad. Sc. URSS ser. 2, II (1934).

Perennial. Forming large tufts; rhizome creeping; culm 25-35 cm tall, smooth; leaves linear, long-acuminate, to 2.5 mm broad, flat, scabrous, abundant at the culm base; ligule 6 mm long, pointed. Panicle spikelike, 3-7 cm long, dense, pale or rather dark purple, with short, very scabrous branches; spikelets 8-11 mm long, narrowly lanceolate, acuminate, scabrous on the keel, serrate at the summit, almost bidentate, awned from just above the base, the awn geniculate, somewhat twisted below, slightly longer than the lemma; callus hairs 2-2.5 mm long; extension of rachilla 2.5-3 mm long, with hairs to 5 mm long. June-August. (Plate XIV, Figure 17, a, b).

Mountain slopes in the alpine zone. - Centr. Asia: Pam. -Al. Endemic. Described from Alai Chain. Type in Leningrad.

21. *C. anthoxanthoides* (Munro) Rgl. in A. H. P. VII (1880) 629 et 640. -*Deyeuxia anthoxanthoides* Munro in Henderson et Hume, Lahore to Yark. (1873) 339.

Perennial. Forming rather compact tufts; culms 10-35 cm tall, glabrous, usually leafless above, surrounded at the base by numerous, rather

long radical leaves; leaves linear, acuminate, to 5 mm broad, blades and sheaths smooth or scabrous. Inflorescence spike-like or subovoid, 1-4 (-6) cm long and 1-2 cm broad, rufous-purple, turning brown, with short branches; spikelets lanceolate, 5-7 mm long; glumes lanceolate, acuminate, subequal; lemma somewhat shorter than the glumes, lanceolate, with four nerves prolonged at the summit into teeth, awned from close to base, the awn geniculate, twisted below, 1 1/2 times as long as the lemma; palea scarcely longer than the lemma; callus hairs 1/5 as long as the floret. Extension of rachilla 1-2.5 mm long, with hairs to 2 mm long. July-August. (Plate XIV, Figure 18 a-d).

Mountain slopes in alpine and subalpine zones. - Centr. Asia: Pam. - Al. (eastern part), Tyan'-Shan. Gen. Distr.: Dzung. - Kashg. Described from centr. Asia. Type in London.

22. *C. laguroides* Rgl. in A. H. P. VII (1880) 639 et 641.

Perennial. Forming rather compact tufts; culms 20-80 cm tall, glabrous, smooth or scabrous, usually leafless above, rather densely leafy at the base; leaves linear, acuminate, to 4 mm broad, smooth or scabrous. Inflorescence oblong or cylindrical, more rarely ovoid, to 4.5 cm long and 1.5 cm broad, pinkish, with short branches; spikelets lanceolate, 5-6 mm long; glumes lanceolate, acuminate, somewhat unequal; lemma 1/2 as long as the glumes, or shorter, lanceolate, serrulate at the summit, awned from the lower 1/4, the awn geniculate, twisted below, 1.5 times longer than the lemma; palea markedly shorter than the lemma; callus hairs approximately 1/4 as long as the floret. Extension of rachilla 1.5-2 mm long, with hairs to 2 mm long. June-September.

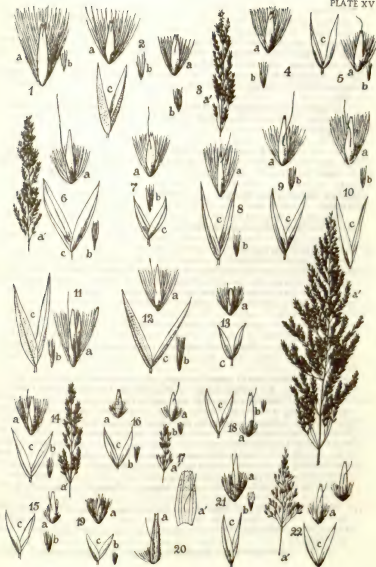
Stony slopes of high-mountain regions. - Centr. Asia: Pam. - Al. (western part). Endemic. Described from Zeravshan Valley. Type in Leningrad.

Series 6. *Flexuosae* Roshev. - Callus hairs as long as the floret or slightly longer. Awn arising from upper part of lemma. Plants of the forest zone of Europe and Siberia.

23. *C. flexuosa* Rupr. in Beitr. z. Pflanzenk. d. Russ. Reiches, IV (1845) 34.

Explanation to Plate XV

1. *Calamagrostis flexuosa* Rupr.: a) lemma; b) extension of rachilla; -2. *C. elata* Blytt.: a) lemma; b) extension of rachilla; c) glumes; -3. *C. villosa* Beauv.: a) lemma; a') inflorescence; b) extension of rachilla; -4. *C. lanceolata* Roth. var. *hypocanthata* Torges.: a) lemma; b) extension of rachilla; -5. *C. Poplowskiae* Roshev.: a) lemma; b) extension of rachilla; c) glumes; -6. *C. alajica* Litw.: a) lemma; a') inflorescence; b) extension of rachilla; c) glumes; -7. *C. Korshinskyi* Litw.: a) lemma; b) extension of rachilla; c) glumes; -8. *C. Alexeenkoana* Litw.: a) lemma; b) extension of rachilla; c) glumes; -9. *C. schugnanica* Litw.: a) lemma; b) extension of rachilla; c) glumes; -10. *C. Langsdorffii* (Link) Trin.: a) lemma; b) extension of rachilla; c) glumes; -11. *C. uralensis* Litw.: a) lemma; b) extension of rachilla; c) glumes; -12. *C. tiberdensis* Litw.: a) lemma; b) extension of rachilla; c) glumes; -13. *C. angustifolia* Kom.: a) lemma; c) glumes; -14. *C. fusca* Kom.: a) lemma; a') inflorescence; b) extension of rachilla; c) glumes; -15. *C. neglecta* (Ehrh.) P. B.: a) lemma; b) extension of rachilla; c) glumes; -16. *C. groenlandica* (Schrad.) Kunth.: a) lemma; b) extension of rachilla; c) glumes; -17. *C. Holmii* Lange.: a) lemma; b) extension of rachilla; a') inflorescence; -18. *C. Steinbergii* Roshev.: a) lemma; b) extension of rachilla; c) glumes; -19. *C. caucasicorum* Socz.: a) lemma; b) extension of rachilla; c) glumes; -20. *C. Bungeana* V. Petr.: a) and a') lemma; -21. *C. kolymensis* Kom.: a) lemma; b) extension of rachilla; c) glumes; -22. *C. deschampsoides* Trin.: a) lemma; a') inflorescence; c) glumes.



Perennial. Rhizome creeping; culm 70-120 cm tall, more or less branching, glabrous or scaberulous; leaves linear, to 8 mm broad, scabrous; ligule to 5 mm long. Panicle oblong, 10-20 cm long, with scabrous branches; spikelets 6-7.5 mm long, more or less purplish; glumes lanceolate, long-acuminate, subequal, copiously puberulent; lemma ca. 4 mm long, bidentate at the summit, awned from above the middle, the straight awn about as long as the lemma; callus hairs longer than the lemma; the hairy extension of rachilla short, with long hairs. July. (Plate XV, Figure 1, a-b).

Damp forests. -European part: Kar. -Lap. (southern part), Dv. -Pech., Lad. -Il'm. Endemic. Described from Slutsk near Leningrad. Type in Leningrad.

NOTE. Species closely related to *C. elata* Blytt.

24. *C. elata* Blytt, Norsk. Fl. (1847) 148 (s. str.); Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 222. -*C. phragmitoides* b. minor Meinsh. Fl. Ingr. (1878) 457 p.p. -*C. Halleriana* var. *Clausiana* C. A. Mets. in Beitr. z. Pflanzenk. d. Russ. Reiches VIII (1851) 166. -*C. purpurea* Asch. et Gr. Synops. II, 1(1899) 201 non Trin. -Exs.: HFR No 2184-a.

Perennial. Rhizome creeping; culm 80-150 cm tall, unbranched at the base, often branching above, glabrous; leaves linear, to 7 mm broad, scabrous; ligule 4-7 mm long, cleft. Panicle 10-20 cm long, contracted, rather nodding, green or brownish-purple, erect, pale purple (var. *rubicunda* (Blytt) Litw.), with scabrous branches; spikelets 4.5-5 mm long; glumes lanceolate at the summit, awned from slightly above the middle, the straight awn usually somewhat longer than the lemma; callus hairs somewhat longer than the lemma; the hairy extension of rachilla 1/2-2/3 mm long, the hairs about as long as those of the callus. June-July. (Plate XV, Figure 2, a, b, c).

Boggy meadows and damp forests. -Arctic: Arct. Eur. (Murman.); European part: Kar. -Lap., Dv. -Pech., Lad. -Il'm., Upp. Volg., Volg. -Kam., Upp. Dnep.; Siberia: all regions; East. Siberia: Yeniz. Gen. Distr.: Scand., Centr. Eur. Described from Norway. Type in Oslo (Norway).

25. *C. vilnensis* Bess. in Roem. et Schult. Add. ad. Mant. II (1817) 602. -*C. Kotulae* Zapal. in Bull. Acad. Cracov. (1904) 163.

Perennial. Rhizome creeping; culms 70-120 cm tall, smooth, more or less branching at the base; leaves linear, long-acuminate, to 3 mm broad, scaberulous, sometimes hairy on the upper surface; ligule 2-3 mm long. Panicle rather loose, ca. 10 cm long, with very scabrous branches; spikelets 4-5 mm long; glumes narrowly lanceolate; lemma lanceolate, 3-4 mm long, deeply bifid, the slender, straight awn attached about the middle and not reaching the summit; callus hairs somewhat longer than the floret; the hairy extension of rachilla stipelike, small, ca. 1/4 mm long, the hairs as long as those of the callus. June-August. (Plate XV, Figure 3, a, a', b).

211 Bogs. -European part: Upp. Volg., Volg. -Kam., Volg. -Don., Low. Don., Zavolzh.; West. Siberia: Ob. region. Gen. Distr.: Scand. (southern part), Centr. Eur. Described from surroundings of Vil'no [now Vil'nyus]. Type in Leningrad.

NOTE. Indistinguishable in appearance from *C. lanceolata* Roth.

26. *C. Poplowskiae* Roshev. sp. nova in Acta Inst. Bot. Ac. Sc. URSS, ser. 2 II (1934).

Perennial. Tufted; rhizome short-creeping; culms 80-100 cm tall, unbranched, glabrous; leaves linear-acuminate, flat, to 5 mm broad, scaberrulous, with glabrous sheaths; ligule on upper leaves to 8 mm broad, on lower ones 2-3 mm. Panicle to 10 cm long, rather loose, somewhat contracted; spikelets lanceolate, ca. 5 mm long, more or less purplish; glumes somewhat unequal, dark purple on the margins, ciliate on the keel; lemma ca. 3.5 mm long, bidentate, awned from between the teeth, the straight awn exceeding the lemma by 2-2.5 mm, i.e., nearly by half the length; callus hairs as long as the floret; extension of rachilla ca. 0.4 mm long, with long hairs; palea 1/2 as long as the lemma; stamens ca. 2 mm long. (Plate XV, Figure 5, a, b, c).

Rocks. - East. Siberia: Ang. - Sayan. Endemic. Described from Zabalkal'e [Transbaikalia] (Barguzin highway, between the stations Gremyachevo and Goryachinsk, banks of Baikal, 26 July, 1913. G.I. Poplavskaia). Type in Leningrad.

Series 7. *Alajicae* Roshev. - Low mountainous plants, not exceeding 30-70 cm in height, with stiff, hard leaves and dense panicles. Occurring only in Pam. - Al.

27. *C. alajica* Litw. in Not. syst. Herb. Horti Bot. Petrop. II (1921) 122.

Perennial. A glaucous-green, tufted, glabrous plant; rhizome creeping; culms 30-65 cm tall, unbranched, more or less geniculately ascending, rigid, 3-noded; leaves flat, to 4 mm broad, scabrous; ligule to 5 mm long. Panicle oblong, dense, somewhat lobed, purplish, turning brown, branches; spikelets ca. 5-6 mm long, narrowly lanceolate; glumes linear-lanceolate, acuminate, subequal; lemma ca. 4 mm long, narrowly lanceolate, bidentate at the summit, awned from the back above the base or somewhat below the middle, the awn exceeding the lemma by nearly 1/2 the length; callus hairs copious, somewhat shorter than the floret; extension of rachilla ca. 1 mm long, with hairs to 3 mm long. July-September. (Plate XV, Figure 6 a-c).

Mountain slopes. - Centr. Asia: Pam. - Al., Tyan'-Shan. Endemic. Described from the northern slope of Alai Range, Olgin Meadow. 15 July, 1895. S. Korzhinskii, No 6085. Type in Leningrad.

28. *C. Korzhinskyi* Litw. in Not. syst. Herb. Horti Bot. Petrop. II (1921) 122.

Perennial. Forming compact tufts; rhizome creeping; culm 50-70 cm tall, undivided, erect, rigid, with 3-4 nodes; leaves linear, long-acuminate, 3-4 mm broad, flat or more or less involute; ligule to 5 mm long, cleft. 212 Panicle 10-15 cm long, contracted, somewhat lobed, more or less purple, turning brown; spikelets ca. 4 mm long, lance-acuminate; glumes unequal, lanceolate; lemma ca. 2.5 mm long, bidentate at summit, awned from upper half, the awn straight, nearly 1 mm longer than the lemma; palea about 1/2 as long as the lemma; callus hairs as long as the floret; extension of rachilla ca. 0.4 mm long, with hairs to 1.5 mm long (Table XV, Figure 7, a-c).

Centr. Asia: Pam. - Al. Endemic. Described from Pamir (Indyravach survey mark by the river Gunt, on dry sandy soil. 16 August, 1897, No 6061. C. Korzhinskii). Type in Leningrad.

29. *C. Alexeenkoana* Litw. sp. nov. in Addenda p. 749.

Perennial. Rhizome short-creeping, forming compact tufts; culms ca. 60 cm tall, unbranched, erect, glabrous, surrounded at the base by numerous sheaths of old leaves; leaves linear; long-acuminate, somewhat scabrous, to 5 mm broad, flat or more or less involute; ligule to 5 mm long, lacerate. Panicle ca. 15 cm long, oblong, contracted, with very scabrous branches to 6 cm long; spikelets narrowly lanceolate, ca. 5-6 mm long; glumes narrowly lanceolate, somewhat unequal, hispidulous all over; lemma ca. 4 mm long, narrowly lanceolate, bidentate at the summit, awned from just below the interdental incision, the awn straight, ca. 5 mm long; callus hairs longer than the floret; extension of rachilla ca. 0.3 mm long, almost naked. (Plate XV, Figure 8, a-c).

High-mountain zone. - Centr. Asia: Pam. - Al. Endemic. Described from the Chinese part of Pamir (Togdumbash-Pamir, in Kara-chukur Valley, 3,400 m. 18 July, 1901. Alekseenko). Type in Leningrad.

30. *C. schugnanica* Litw. in Not. syst. Herb. Horti Bot. Petrop. II (1921) 123.

Perennial. A glaucous-green, tufted plant; rhizome creeping; culm 30-40 cm tall, unbranched, rigid, glabrous, 2-3-noded; leaves linear, long-acuminate, flat, ca. 2 mm broad, scabrous on the margin; ligule to 3 mm long, pointed. Panicle 5-10 cm long and to 3 cm broad, dense, more or less purplish, with very scabrous branches; spikelets ca. 4-4.5 mm long, narrowly lanceolate; glumes narrowly lanceolate, somewhat unequal. Lemma ca. 3.5 mm long, narrowly lanceolate, setulose-serrulate at the summit, awned from the middle or slightly below, the awn geniculate, attaining 3 mm in length; callus hairs copious, somewhat shorter than the floret; extension of rachilla ca. 1 mm long, with hairs up 2.5 mm long. July. (Plate XV, Figure 9, a-c).

Alpine meadows. - Centr. Asia: Pam. - Al. Endemic. Described from Shugnan (Shakh-dara Valley, 24 July, 1897, No 6077, S. Korzhinskii). Type in Leningrad.

213 NOTE. A species closely related to *C. alajica* Litw., from which it is mainly distinguished by the serration of lemma, somewhat smaller size, and narrower leaves.

Series 8. *Langsdorffianae* Roshev. - Awn dorsally attached on the middle part of lemma. Callus hairs about as long as the floret. Plants of the floret zone of the USSR and of Ciscaucasia, predominantly in the Far East.

31. *C. Langsdorffii* (Link.) Trin. Gram. unifl. (1824) 225; Griseb. in Ldb. Fl. Ross. IV (1853) 430; Shmal'g. Fl. II. 608; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 219; *Arundo Langsdorffii* Link, Enum. hort. Berol. II (1821) 74. - A. (*Calamagrostis*) *purpurea* Trin. in Spreng. Neue Ent. II (1821) 52. - *Calamagrostis phragmitoides* a. major Meinh. Fl. ingr. (1878) 457. - *C. notabilis* Litw. in Not. syst. Herb. Horti Petrop. II (1921) 124. - *C. Langsdorffii* var. *pulchella* Litw. in Sched. Herb. Fl. Ross. VIII (1922) 169, No 2728. - *C. grandis* V Petr. Fl. Jakut. I (1930) 216. - *C. strigosa* Griseb. in Ldb. Fl. Ross. IV (1853) 428 non Bong. - Ic.: Trin., l. c., tab. IV, fig. 3, 10. - Exs.: HFR No 2189, 91 et 2726-30.

Perennial. Rhizome creeping; culms 80-150 cm tall, usually branching; leaves to 10 mm broad, linear, scaberulous; ligule to 10 mm long, obtuse

or lacerate. Panicle rather dense, 10-25 cm long, with very scabrous branches; spikelets brownish-red, more rarely greenish, 4-5 mm long, more rarely 3.5-4 mm (var. *gracilis* Litw.) or 5-6 mm (var. *major* (Meinsh.) Litw.); glumes lanceolate, long-acuminate, subequal, scabrous on the keel, more rarely ciliate (var. *piliger* Litw.). Lemma lanceolate, 3-3.5 mm long, awned from about the middle, more rarely from the upper 1/3 (var. *notabilis* Litw.), the awn straight or slightly bent (not twisted), about as long as the lemma, very rarely awn much shorter than the lemma (var. *submutica* Litw.); callus hairs slightly longer than the floret or about as long; extension of rachilla ca. 1 mm long, with hairs as long as the hairs of the callus. June-August. (Plate XV, Figure 10, a-c).

River valleys and forest glades. -Arctic: Arct. Eur. (rarely); European part: Kar. -Lap., Dv. -Pech., Lad. -Il'm., Upp. Volg., Volg. -Kam., Upp. Dnep., Zavolz.; Caucasus: Ciscauc. (?); West. Siberia: all regions; East. Siberia: all regions; Far East: all regions; Centr. Asia: Pribalkh. (eastern part), Dzung. -Tarb. Gen. Distr.: Scand., Dzung. -Kashg., Mong., Jap. -Chin., N. Am. Described from Kamchatka. Type in Leningrad.

ECONOMIC IMPORTANCE. In Siberia and in the Far East it constitutes an important part of hay for storage. The quality of hay prepared before flowering is satisfactory, later poor.

32. *C. uralensis* Litw. in Not. syst. Herb. Horti Bot. Petrop. II (1921) 124.

214 Perennial. Rhizome creeping; culms ca. 100 cm tall, erect, glabrous; leaves linear-acuminate, flat, 4-5 mm broad, scabrous; ligule 3-4 mm long, subobtuse-lacerate. Panicle oblong, to 20 cm long, rather contracted, with very scabrous branches; spikelets lanceolate, 6-8 mm long, dingy purple; glumes narrowly lanceolate, unequal, the lower 1-nerved, the upper 3-nerved; lemma 4.5 mm long, 5-nerved, awned from just above or below the middle, the awn straight, as long as the lemma or slightly longer; callus hairs ca. 4 mm long; extension of rachilla distinct, with hairs 4-4.5 mm long. June-July. (Plate XV, Figure 11, a-c).

Mountains and foothills, river valleys. -European part: Volg. -Kam. and Zavolz. Endemic. Described from Ural. Type in Leningrad.

33. *C. teberdensis* Litw. in Sched. Herb. Fl. Ross. VII (1911) 83. -*C. villosa* Auct. fl. cauc. -Exs.: HFR No 2196.

Perennial. Rhizome with long underground offshoots; culms to 1.3 m tall, more or less branching, glabrous at the base, prominently scabrous only below the panicle, 4-5-noded; leaves linear, long-acuminate, to 7 mm broad; blades and sheaths scabrous; ligule to 6 mm long, cleft. Panicle elongate-lanceolate, to 25 cm long, contracted after anthesis, with branches to 7 cm long; spikelets ca. 6.5 mm long, lanceolate, pinkish-purple; glumes oblong-lanceolate, acuminate, subequal; lemma ca. 4.5 mm long, bidentate at the summit, awned from below the middle, the awn slightly bent, as long as the lemma; callus hairs as long as the floret; extension of rachilla firm, ca. 1 mm long, with long hairs. July. (Plate XV, Figure 12, a-c).

River banks. -Caucasus: Ciscauc. Endemic. Described from Teberda River (above the village Teberdinskoe, near the country houses (1270 m), 23 July, 1905, D. Litvinov). Type in Leningrad.

34. *C. angustifolia* Kom. in Not. system. Herb. Horti Bot. USSR (1926) 192. -*l.*: Kom. and Al. Opred. (Determinations) I (1931) tab. 52.

Perennial. Plant forming compact tufts; rhizome creeping; culms erect, 50-120 cm tall, 4-5-noded, glabrous; leaves linear, long-acuminate, at most 2 mm broad, flat or partly involute, scaberulous; ligule to 5 mm long, obtuse, lacerate. Panicle 7-13 cm long, oblong, rather contracted, with prominently scabrous branches; spikelets narrowly lanceolate, ca. 3.5 mm long, pale purple, turning yellow; glumes narrowly lanceolate, acuminate, subequal; lemma ca. 3 mm long, serrate at summit, awned from about the middle, the straight awn slightly exceeding it; extension of rachilla stipelike, 0.8-1 mm long, with hairs to 3 mm long. June-August. (Plate XV, Figure 13, a, c).

Wet meadows. - Far East: Ussur. Endemic. Described from environs of Golubovka by the river Suchan. 1913, A. Bulavkina. Type in Leningrad.

ECONOMIC IMPORTANCE. In many places the main constituent of the sward, and hence of the hay. Quality of hay satisfactory.

215 35. *C. fusca* Kom. in Bull. Jard. Princ. Bot. URSS (1931) 197.

Perennial. Forming loose tufts; rhizome creeping, branching; culms 40-80 cm tall and 1-3 mm thick, ascending, weakly branching, rooting at the lower nodes, rubescent (like the entire plant), usually 3-leaved; sterile shoots ca. 20 cm tall, 5-8-leaved; leaves linear-acuminate, 10-15 cm long and 3-5 mm broad, dark green, smooth; ligule ca. 5 mm long. Panicle oblong, 6-18 cm long and 1-3 cm broad, dense, with scabrous branches; spikelets lanceolate, ca. 4 mm long, blackish-rubescens or purplish-steel-colored; glumes lanceolate, acuminate, subequal, hirtellous; lemma ca. 3 mm long, narrowly lanceolate, serrate at the summit, awned from below the middle, the awn straight, ca. 2-2.5 mm long, slightly longer than the lemma; callus hairs as long or slightly longer than the floret; extension of rachilla stipelike, 0.5-0.7 mm long, with hairs to 3 mm long. August. (Plate XV, Figure 14, a-c).

Wet meadows and alder scrubs. - Far East: Kamch. Endemic, (described from the upper course of Sedanka River, from Mountain Shapochka near Nachika, from the Uzon Volcano and vic.). Type in Leningrad.

Series 9. *Neglectae* Roshev. - Callus hairs about as long as the floret or slightly shorter. Awn straight or bent. Distributed in subpolar countries and in marshes of the forest zone of USSR.

36. *C. neglecta* (Ehrh.) P. B. Agrost. (1912) 157 non Gaertn.; Griseb. in Ldb. Fl. Ross. IV 428; Shmal'g. Fl. II, 608; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 218. - *Arundo neglecta* Ehrh. Beitr. VI (1791) 137. - *Deyeuxia neglecta* Kunth, Rev. gram. I (1835) 76. - *Arundo stricta* Timm in Siemssen Meckl. Mag. II (1795) 236. - *Calamagrostis stricta* Koel. Descr. graminum (1802) 105. - *C. jakutensis* V. Petr. Fl. Jakutiae I (1930) 214. - Ic.: Rchv. Ic. Fl. Germ. I (1834) tab. 37, fig. 1439. - Exs.: HFR No 1348, 2736-2738.

Perennial. Rhizome creeping; culms 50-100 cm tall, unbranched, smooth; leaves narrow, linear, rather involute, rarely flat, to 5 mm broad (var. *latifolia* Anderss.); ligule 2-4 mm long, more or less lacerate. Panicle dense, contracted, sometimes subspicate, more rarely loose, to 15 cm long, with prominently scabrous branches, sometimes narrower, dark purple (var. *borealis* Laest.); spikelets ca. 3.5 mm long, or 4-4.5 mm (var. *stricta* Griseb. = *C. stricta* (Timm) Koel.), more rarely 2.5-3 mm (f. *jakutensis* (V. Petr.) Roshev.) reddish-brown or greenish; glumes broadly lanceolate, short-acuminate, subequal; lemma obtuse

or serrate at the summit, the straight awn attached about the middle; callus hairs about 1/2 as long as the floret, more rarely shorter (var. *brachytricha* Litw.), or nearly as long as the floret (var. *dolichotricha* Litw.); extension of rachilla stipelike, ca. 1 mm long, with hairs 1-1.5 mm long. June-July. (Plate XV, Figure 15, a-c).

- 216 Peat and sedge bogs, boggy meadows, and wet solonchaks. -Arctic: Arct. Eur. (southern part), Anad.; European part: Kar.-Lap., Dv.-Pech., Lad.-Il'm., Upp. Volg., Volg.-Kam., Upp. Dnep., Mid. Dnep., Volg.-Don., Zavolzh.; Caucasus: South. Transcauc. (Maral-dag foothills, 9 August, 1928. O. Zeidel'meier); West. Siberia: all regions; East. Siberia: all regions; Far East: all regions; Centr. Asia: Aral.-Casp. (northern part), Pribalkh. (northern part), Pam.-Al. (mountainous part). Gen. Distr.: Scand., Centr. Eur., Atl. Eur. Described from the vicinity of Upsala in Sweden. Type in Gottingen.

ECONOMIC IMPORTANCE. If cut for hay not later than the middle of the heading period, furnishes nutritious fodder for cattle and sheep. In the conditions of northern tundra it provides food for deer at the beginning of summer.

C. neglecta P. B. x *C. elata* Blytt. ex Litw. in Sched. Herb. Fl. Ross. VII (1911) 85. -*C. neglecta* P. B. x *C. purpurea* Alm. in Neuman. Sver. Fl. (1901) 767. -Exs.: HFR No 2200; Kneuck. Gram. exs., No 627.

Perennial. Rhizome thin, sometimes branching; culms unbranched, 1-1.45 m tall, sometimes geniculate ascending; upper leaves narrow, often involute, lower leaves broad, to 6 mm long; ligule ca. 4 mm long. Panicle 10-15 cm long, dense, contracted, green or reddish; spikelets 3.75-4.5 mm long, oblong-lanceolate; glumes somewhat unequal; lemma awned from just below the middle, the awn straight, not reaching the summit; callus hairs nearly as long as the floret; extension of rachilla well developed, with long hairs. July.

Boggy meadows. -European part: Lad.-Il'm. Gen. Distr.: Scand. Described from Sweden. Type in Oslo.

C. neglecta P. B. x *C. Langsdorffii* Trin. ex Litw. in Sched.

Perennial. Rhizome creeping; culms 60-80 cm tall, slender, branching, scabrous; leaves linear, narrow, 2-3(-5) mm broad, long-acuminate, rather prominently scabrous; ligule to 4 mm long. Panicle elongate-lanceolate, 8-10 cm long, many-flowered, rather contracted, delicate; spikelets ca. 3 mm long, lanceolate, more or less purplish, turning brown; glumes somewhat unequal; lemma obscurely serrate at the summit, awned from about the middle, the straight awn slightly exceeding the lemma; callus hairs about as long as the floret; extension of rachilla with long hairs, attaining the length of lemma. July.

Boggy meadows and coppices. -European part: Dv.-Pech. Gen. Distr.: not determined.

37. *C. groenlandica* (Schr.) Kunth. Revis. gram. I (1829) 79. -*Arundo groenlandica* Schrad. Regensb. Denkschr. II (1818) 8. -*C. lapponica* Trautv. Fl. Taym. (1847). -*C. borealis* Laest. Bidr. Vaextl. Torn. Lappm. (1860) 44. -*C. neglecta* var. *stricta* Trautv. in A. H. P. V. (1877) 143. -*C. stricta* var. *borealis* Hartm. Scand. Fl., ed. 2 (1879) 517.

- Perennial. Tufts loose; rhizome creeping; culms 10-30 cm tall, un-
217 branched, glabrous; leaves narrowly linear, 1-2 mm broad, more or less

involute, smooth on the outside, scabrous on the upper surface; ligule 0.5-1.5 mm long, obtuse. Panicle narrowly lanceolate, subspicate, dense, to 6 cm long, with scabrous branches; spikelets lanceolate, to 3 mm long, rather dark purple, turning brown; glumes about equal, lanceolate, smooth or scabrous on the keel; lemma nearly as long as the glumes, minutely puberulent, with 2 short teeth at the summit, awned from about the middle, the straight awn about half as long as the lemma; extension of rachilla ca. 1 mm long, with hairs as long as the callus hairs. July-August. (Plate XV, Figure 16, a-c).

Polar tundra, often along sandy river banks. -Arctic: Arct. Eur., Nov. Zem., Arct. Sib., Chukot. Gen. Distr.: arctic region of northern hemisphere. Described from Greenland and Labrador. Cotype from Labrador in Leningrad.

38. *C. Holmii* Lange in Holm, Nov. Zeml. Veg. (1887) 20 (separ. (1885) 16); Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 217.

Perennial. Rhizome creeping; tufted; culms 10-25 cm tall, 2-3-noded, glabrous; leaves narrowly linear, involute, 0.5-0.7 mm broad, smooth; ligule 0.5-0.75 mm long, entire. Panicle 2-5 cm long, usually many-flowered, contracted, more rarely loose (f. *laxior* Roshev.); spikelets 3-4 mm long, lanceolate, purplish or brownish; glumes lanceolate, short-acuminate, subequal, glabrous; lemma 5-nerved, smooth, scaberulous only at the summit, awned from upper part, the awn straight; callus hairs scant, 1/2-2/3 as long as the lemma; extension of rachilla small, hairy. July-September. (Plate XV, Figure 17, a-c).

Tundra, on sands. -Arctic: Arct. Eur., Nov. Zem., Arct. Sib., Anad. Gen. Distr.: Arctic. Described from Novaya Zemlya. Type in Sweden.

39. *C. Steinbergii* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 296.

218 Perennial. Rhizome creeping; culms 10-12 cm tall, ascending, glabrous, leafless above; leaves linear, up to 1.5 mm broad, rather involute, glabrous; ligule 0.5-1 mm long, obtuse. Panicle 2.5-3 cm long, oblong, loose, few-flowered, with scaberulous branches to 6 mm long; spikelets 4-5 mm long, lanceolate, more or less purple; glumes subequal, 3.5-4.5 mm long, narrowly lanceolate; lemma lanceolate, glabrescent or minutely puberulent, bidentate at the summit, 3.5-4 mm long, awned from just below the summit, the awn 0.5-2.0 mm long, straight or bent, not exceeding the spikelet; callus hairs 1/3-1/2 as long as the floret; extension of rachilla ca. 1 mm, naked or almost so. (Plate XV, Figure 18, a-c).

Arctic: Arct. Sib. Endemic. Described from Litke Island, on sandstone (collector unknown). Type in Leningrad.

40. *C. czukczorum* Soczawa sp. nov. in Addenda p. 749.

Perennial. Rhizome creeping; culms solitary, 28-35 cm tall and 1-1.5 mm thick; leaves narrowly linear, 1-1.5 mm broad, those of the culm shorter than those of the innovations, glabrous; ligule very short, obtuse, slightly fimbriate. Panicle rather loose but not open, light purple, ca. 6 cm long and 1.5 cm broad, with very scabrous, flexuous, obliquely rising branches; spikelets small, light-colored, mostly 5 per branch; glumes 2.5 mm long, very scabrous on the keel; lemma slightly shorter than the glumes, with two teeth separated by a deep notch, awn attached just below the middle and not exceeding the lemma; callus hairs rather few, as long as the lemma or slightly longer; anthers 1.1-1.2 mm long; extension of rachilla ca. 1 mm long, with hairs to 2 mm long. July.

Low-growing plant communities. -Arctic: Anad. Endemic. Described from Anadyr' Krai, Belaya River basin at Chuvanskii Post, 31 July 1931. V.B. Sochava. Type in Leningrad. (Plate XV, Figure 19, a-c).

41. *C. Bungeana* V. Petr. Fl. Jakutiae (1930) 209. -*C. neglecta* var. *stricta* Trautv. in A.H.P. X, 2 (1882) 544.

Perennial. Forming dense, compact tufts, nonrhizomatose; culms in small groups, unbranched, 40-50 cm tall, slender, smooth, with numerous sterile shoots; leaves of the innovations filiform, folded, 0.3-0.4 mm broad, those of the culm reduced in length, flat, to 2 mm broad; ligule 0.5-1 mm long. Panicle elongate-elliptical, contracted, many-flowered; spikelets to 4.5 mm long, lustrous, golden-honey-red; glumes subequal, smooth, setose on the keel; lemma as long as the glumes, 4-toothed at the summit, the slender, slightly bent awn attached at the middle or slightly below it; callus hairs about 1/2 as long as the floret; extension of rachilla with hairs attaining the length of the lemma. July-August. (Plate XV, Figure 20, a, a').

Arctic: Arct. Sib. Endemic. Described from Ulakhan-Sular, by the river Yana. 7 July 1885. A. bunge.

NOTE. Type in the herbarium of BIN [Komarov Botanical Institute of the U.S.S.R. Academy of Sciences] missing, although V. Petrov determined it from specimens of the Botanical Museum of the Academy of Sciences. It has been proposed that this species is none other than *C. kolymaensis* Kom.

219 42. *C. kolymaensis* Kom. in Not. syst. Herb. Horti Bot. Petrop. II (1921) 129.

Perennial. Forming compact tufts; culms 15-20 cm tall, ascending, 3-4-noded, glabrous, with numerous sheaths of old leaves at the base; leaves narrowly linear, long-acuminate, 1-2.5 mm broad, rather flat, leaves of the culm shorter than those of the innovations; ligule 0.5-0.7 mm long, round. Panicle loose, narrow, 2-8 cm long and 0.5-2 cm broad, usually not dense, rather strongly tinged, with scabrous branches; spikelets 4-5 mm long, lanceolate; glumes broadly lanceolate, about equal, scabrous on the keel toward the summit; lemma bidentate or bifid at the summit, awned from the lower 1/4, the awn scabrous, bent, somewhat longer than the lemma; callus hairs 1/3-1/2 as long as the lemma; extension of rachilla 1/4 as long as the lemma, with hairs 1/2 as long as the lemma. August. (Plate XV, Figure 21, a-c).

Wet places in the tundra. -East, Siberia: Len.-Kol., Endemic. Described from the estuary of Kolyma River (sea coast by the Bol'shoi Baranov Cape, pebble, 23 August 1905. I. Shyl'ga). Type in Leningrad.

43. *C. deschampsoides* Trin. Ic. Gram. III (1836) tab. 354; Griseb. in Ldb. Fl. Ross. IV (1853) 427. -*C. obtusata* Turcz. in Bull. Soc. Nat. Mosc. XXIX 1 (1856) 26 (pp.). -*Deyeuxia deschampsoides* Scribn. in Bull. Torr. Bot. Cl. X (1883) 8. -*Calamagrostis inopia* Litw. in Not. syst. Herb. Horti Petrop. II (1921) 125.

Perennial. Forming rather loose tufts; culms 20-30 cm tall, ascending, slender, smooth, 2-3 noded; leaves narrowly linear, rather involute, scabrous on the upper surface; ligule ca. 1.5 mm long. Panicle from 2 to 7 cm long, oblong or pyramidal, few-flowered; spikelets 4-4.5 mm long, more or less brownish-purple-tinged; glumes lanceolate, acuminate, subequal, glabrescent; lemma bidentate at the summit, the bent awn attached

about the middle. Callus hairs attaining $1/2$ the length of lemma; extension of rachilla 1.5 mm long, with hairs as long as those of the callus. July-August. (Plate XV, Figure 22, a-c).

Sandy places in the tundra. -Arctic: Arct. Eur., Chuk., Anad.; Far East: Kamch., Okhot. Gen. Distr.: Bering. Described from Kamchatka. Type in Leningrad.

Series 10. *Lapponicae* Roshev. -Awn bent, about as long as the spikelet. Plants of the forest zone of the U.S.S.R., more rarely of the tundra

44. *C. lapponica* (Whlbg.) Hartm. Handb. Scand. Fl. (1820) 46; Griseb. in Ldb. Fl. Ross. IV 429; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II 217. -*Arundo lapponica* Whlbg. Fl. lapp. (1812) 27. -*Calamagrostis varia* auct. fl. sibir. ex parte. -*C. unilateralis* V. Petr. Flora Jakutiae I (1930) 201. -*C. sibirica* V. Petr., l.c., 203. -*C. Henriettae* V. Petr., l.c., 207. -l.c.: Whlbg., l.c., tab. 1. -Exs.: Fries, Herb. Norm. II, No 86; HFR No 2731, 2732.

Perennial. Forming loose tufts; rhizome long-creeping; culms more or less ascending, 30-100 cm tall, glabrous, scabrous only below the inflorescence; leaves narrowly linear, long-acuminate, the radical leaves and those of the sterile shoots 1-1.5 mm broad, setaceous-involute, culm leaves rather flat, 3-6 mm broad; ligule 2-3 mm long, often lacerate. Panicle 5-15 cm long, contracted, rather strongly tinged, more rarely almost green branches short, more rarely to 5 cm long (var. *opima* Hartm.); spikelets lanceolate, 4-6 mm long; glumes subequal, scaberulous, short-acuminate; lemma somewhat shorter than the glumes, faintly scaberulous, awned from below the middle, the awn more or less bent in its lower $1/3$ (but not twisted), as long as the lemma or slightly longer; callus hairs as long as the lemma; extension of rachilla ca. 1 mm long, with hairs nearly as long as the lemma, more rarely the stipe 1.5-2 mm long (var. *Gorodkowi* Litw.). June-August. (Plate XVI, Figure 1, a-c).

Dry arctic tundra and dry mountain slopes in the subalpine zone. -Arctic: Arct. Eur., Arct. Sib., Chuk.; European part: Kar. -Lap., Dv. -Pech. Volg.-Kam.; West. Siberia: Ob region, Alt., East. Siberia: Yenisei, Len.-Kol., Ang. -Sayan., Daur.; Far East: Okhot., Ze. -Bur. Gen. Distr.: Scand., N. Am. Described from Lapland. Type in Upsala, Sweden.

45. *C. obtusata* Trin. De gram. unifl. (1824) 225; Griseb. in Ldb. Fl. Ross. IV 430; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II 215. -*C. deschampsiioides* Turcz. Fl. baical. -dah. II. 2 (1856) 313 (non Trin.). -*C. varia* var. *macilentissima* Ldb. Fl. Alt. I (1829) 88. -*C. varia* auct. Fl. sibir. ex parte. -Exs.: HFR No 2192, 2735 a-d.

Perennial. Rhizomes long, branching; culms 50-130 cm tall, glabrous or scabrous below the inflorescence and below the nodes; leaf sheaths glabrous or hairy (var. *pilosa* Litw.); leaves linear-acuminate, to 7 mm broad, flat, rather scabrous, clothed with soft hairs on the upper surface; ligule to 5 mm long, obtuse. Panicle narrow, to 20 cm long and 1-4 cm broad, dense, with scabrous branches; spikelets 3-4 mm long, lanceolate, pale green (var. *pallida* Litw.) or brown-purple; glumes lanceolate, short-acuminate, smooth or puberulent; lemma lanceolate, obtuse and serrate at summit, awned from slightly above the base, the awn ca. 2 mm long, geniculate, bent in its upper part, and somewhat exerted from the side of the spikelet; callus hairs not exceeding $1/2$ the length of lemma; extension of rachilla ca. 2 (-3) mm long, with long hairs. July-August. (Plate XVI, Figure 2, b-d).

Sandy, damp coniferous and mixed forests, more rarely meadows. - Arctic: Arct. Eur., European part: Kar. -Lap., Dv. -Pech., Volg. -Kam., Zavolzh.; West. Siberia: all regions of the forest zone; East. Siberia: all regions of the forest zone; Far East: Ze. -Bur.; Centr. Asia: Dzung. - 221 Tarb. Gen. Distr.: Scand. Mong. Described from Tobol'sk Raion. Type in Leningrad.

46. *C. chalybaea* (Laest.) Fr. in Hartm. Handb. Scand. fl., ed. 4 (1843) 24. - *Arundo lapponica* β *chalybaea* Laest. in Vet. Acad. Handl. (1824) 161. - *C. varia* auct. Fl. sibir. ex parte. - Exs.: Fries, Herb. norm. XV, No 93.

Perennial. Rhizome short-creeping; culms 80-120 cm tall, glabrous, unbranched; leaves linear-acuminate, to 6 mm broad, very scabrous; ligule oblong, 3-4 mm long. Panicle more or less fusiform, 10-20 cm long, somewhat purplish branches very scabrous, to 8 cm long; spikelets 3.5-4 mm long, lanceolate; glumes lanceolate, subequal; lemma lanceolate, acuminate, awned from slightly above the base, the awn geniculate, straight above, not quite reaching the summit; callus hairs slightly exceeding 1/2 the length of the floret, or nearly as long as the floret (var. *baicalensis* Litw. - *C. baicalensis* Steph. in sched.); extension of rachilla ca. 1-1.5 mm long, the hairs longer than the lemma or as long as the callus hairs (var. *sibirica* Litw.). July-August. (Plate XVI, Figure 3, b-d).

Wet meadows and river banks. - European part: Kar. -Lap., Dv. -Pech.; West. Siberia: Ob region; East. Siberia: Daur. Gen. Distr.: Scand. Described from Scandinavia. Type in Oslo (Norway).

47. *C. Pavlovii* Roshev. in Bull. Jard. Bot. Acad. URSS XXX (1932) 295.

Perennial. Rhizome creeping; culms 100-170 cm tall, erect, glabrous, leafy; leaves flat, to 13 mm broad and 25-40 cm long, long-acuminate, scabrous, with a more or less pronounced glaucous bloom; ligule 5-8 mm long, pointed or cleft. Panicle rather dense, oblong-lanceolate, 18-20 (-23) cm long and 5 cm broad, greenish-purple or purple, very scabrous branches to 10 cm long; spikelets 5.5-7 mm long, lanceolate; glumes somewhat unequal, the lower 5-7, the upper 4-6 mm long, very scabrous on the keel; lemma lanceolate, short-bidentate at the summit, awned from the lower 1/4, the awn bent, scarcely exceeding the lemma; callus hairs ca. 1/2 as long as the floret; extension of rachilla ca. 1 mm long, with hairs 2-4 mm long. July. (Plate XVI, Figure 4, b-d).

Spruce forests. - Centr. Asia: Dzung. - Tarb. Endemic. Described from Lepsy Raion (in a spruce forest by the Syry-Chel'da River, near the Chulak survey mark. 25 July 1928. N. Pavlov). Type in Leningrad.

48. *C. sachalinensis* F. Schm. in Mem. Ac. Sc. Pétersb., sér. 7. XII (1868) 202, tab. VIII, fig. 8-14. - *C. Litwinowi* Kom. in Fedde, Rept. sp. nov. XIII (1914) 86.

222 Perennial. Tufted; rhizome short-creeping; culms 60-80 cm tall, slender, smooth, leafy; leaves linear, acuminate, to 6 mm broad, flat or slightly involute, scabrous; ligule short, obsolete on the upper leaves. Panicle to 10 cm long, narrowly oblong, rather loose, with very scabrous branches; spikelets lanceolate, pale or more or less purple, ca. 5 mm long; glumes unequal, scabrous on the keel; lemma lanceolate, bidentate at the summit, awned from below the middle, the awn slightly bent, more rarely straight, usually somewhat shorter than the body; callus hairs 1/2-3/4 as long as

the lemma; extension of rachilla ca. 0.5 mm long, with hairs to 2 mm long. August–September. (Plate XVI, Figure 5, b–d).

Wet meadows and river banks. –Far East: Kamch., Sakh. Gen. Distr.: Jap. –Chin. Described from Sakhalin (riverside near Arkevo, 8 September, 1860. Glen). Type in Leningrad.

49. *C. aleutica* Trin. in Mém. Acad. Sc. Pétersb., sér. 6 II (1833) 171; Griseb. in Ldb. Fl. Ross. IV, 427. *C. kastalskyi* Litw. in Not. syst. Herb. Horti Bot. Petrop. II (1921) 118.

Perennial. Rhizome creeping; culms 60–80 cm tall, glabrous, unbranched; leaves linear-lanceolate, flat, to 8 mm broad, scabrous on the upper surface; ligule 1.5–3 mm long, oblong. Panicle 13–20 cm long, rather contracted, many-flowered, branches very scabrous due to minute bristles; spikelets narrowly lanceolate, ca. 6 mm long, green or somewhat purplish; glumes linear-lanceolate, acuminate, the lower 1-nerved, the upper 3-nerved, about equal; lemma ca. 5 mm long; serrate at the summit, awned from about the middle, the awn straight or slightly bent (not longer than the lemma or even much shorter (1–2.5 mm long); callus hairs ca. 1.5–2 mm long; extension of rachilla stipelike, 0.5 mm long, with hairs to 1.5 mm long. (Plate XVI, Figure 6, b–d).

Far East: Kamch. (location not recorded, Kastal'skii, 1827). Gen. Distr.: Aleutian Islands, Unalaska, Sitka. Described from Unalaska. Type in Leningrad.

Series 11. Arundinaceae Roshev. –Awn geniculate, nearly always longer than the spikelet. Callus hairs not exceeding 1/2 the length of the floret. Plants of the forest zone, more rarely of subpolar regions or mountains.

50. *C. arundinacea* (L.) Roth, Tent. Fl. germ. II 1 (1789) 89; Shmal'g. Fl. II, 609; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II 212. –*Agrostis arundinacea* L. Sp. pl. (1753) 61. –*Arundo silvatica* DC. Fl. France V (1815) 253; Griseb. in Ldb. Fl. Ross. IV, 426. –*Deyeuxia sylvatica* Kunth, Rev. Gram. I (1829) 77. –*Id.*: Rchb. Ic. Fl. Germ. I, tab. 38, fig. 1440. –Exs.: HFR No 243, 2739–2743 et 2183 b, c.

223 Perennial. Tufted; rhizome creeping. Culms 60–125 cm tall, glabrous, unbranched, scabrous below the inflorescence; leaf sheaths scaberulous more rarely pubescent (var. *pubescens* Torges); leaves linear, long-acuminate, 4–7 mm broad, more rarely 7–10 mm (var. *latifolia* Litw.). Panicle to 25 cm long, rather contracted, many-flowered, with very scabrous branches; panicle sometimes interrupted, consisting of distinct clusters of spikelets (var. *interrupta* Torges); spikelets ca. 5 mm long, more rarely to 7 mm long (var. *grandiflora* Litw.), greenish or purplish (f. *colorata* Litw.); glumes lanceolate, subequal; lemma elongate-lanceolate, cleft at the summit, awned from near the base, the awn long, geniculate, to 7 mm long, more rarely 8–10 mm (var. *macranthera* Torges); callus hairs 1/5–1/4 as long as the floret, more rarely attaining 1/3 of its length (var. *macrotricha* Litw.); extension of rachilla stipelike, ca. 1 mm long, with hairs 2–3 mm long. June–August. (Plate XVI, Figure 7, b–d).

Forests and coppices. –European part: Kar. –Lap., Dv. –Pech., Lad. –Il'm., Upp. Volg., Volg. –Kam., Upp. Dnep., Mid. Dnep., Volg. –Don., Zavoizh., Low. Don. (northern part); Caucasus: all regions (except Tal.);

West. Siberia: all regions; East. Siberia: Yenisei, Ang.-Sayan, Daur. Gen. Distr.: Scand., Centr. and Atl. Eur., Balk.-As. Min., Arm.-Kurd. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. If cut before flowering the plant yields hay of satisfactory quality.

C. arundinacea Roth $\times$ *C. elata* Blytt ex Lehm. in Shed. Herb. Fl. Ross. VII (1911) 83. - *C. arundinacea* Roth $\times$ *C. purpurea* Alm. in Neum. Sver. Fl. (1901), 765. - *C. arundinacea* Roth $\times$ *C. phragmitoides* Torges in Mitt. Thür. bot. Ver. Neu Folge XXI (1906) 105. - *C. Hartmanniana* β *laxior* Blytt, Norges Fl. (1861) 87. - Exs.: HFR No 2197.

Perennial. Rhizomes short-creeping; culms unbranched or almost so, 1-1.25 m tall, glabrous, scabrous below the inflorescence; leaves 4-6 mm broad, scabrous, flat; ligule 4 mm long. Panicle 14-30 cm long, contracted, rather open at anthesis; spikelets 4.5-5 mm long, reddish or purplish; glumes subequal, tapering into a point; lemma awned from near the base, the awn geniculate, slightly longer than the lemma; callus hairs 2/3-3/4 as long as the lemma; extension of rachilla well developed, with few hairs. July.

Boggy places and scrubs. Recorded for the European part: Lad. - II'm. Gen. Distr.: Scand. Described from Estonia (Wesenberg [Rakvere] Distr., near Kandel'. July 1908. R. Lebert). Type in Leningrad.

C. arundinacea Roth $\times$ *C. epigeios* Roth. ex Heidenreich in Oesterr. Bot. Zeitschr. XVI (1866) 143. - *C. acutiflora* Rchb. Fl. germ. excurs. (1830) 26.; Griseb. in Ldb. Fl. Ross. IV (1853) 427. - *Arundo acutiflora* Schrad. Fl. germ. I (1806) 217. - Exs.: HFR (sub. f. *perepigeios* Almquist) No 2198 a.

Perennial. Culms 100-150 cm tall; rhizome long, creeping; leaf sheaths smooth. Inflorescence somewhat closely lobed; glumes lanceolate, long-acuminate; lemma awned from the lower 1/4, the awn geniculate, twisted below, nearly as long as the floret or longer; callus hairs less than 1/2 the length of the floret or nearly as long as the floret; extension of rachilla fairly well developed, but occasionally lacking.

- 224 Often occurring where the two species are present side by side. - European part: Kar. - Lap., Lad. - II'm., Volg. - Kam., Upp. Dnep.; West. Siberia: Ob. region, Upp. Tob., Irt.; East. Siberia: Ang.-Sayan. Gen. Distr.: Scand., Centr. Eur. Described from Germany (Tilsit [Sovetsk])*.

NOTE. Variable in appearance, with predominance of characters of either *C. arundinacea* - f. *perarundinacea* or of *C. epigeios* - f. *perepigeios*.

C. arundinacea Roth. $\times$ *C. lanceolata* Roth ex C. Heidenreich in Oesterr. Bot. Zeitschr. XV (1865) 151. - *C. silvatica* $\times$ *lanceolata* Heidenreich, l. c. - *C. Calamagrostis* $\times$ *arundinacea* Asch. et Gr. Syn. II. I (1898) 213. - *C. Hartmanniana* Fries Summa veg. Scand. I (1846) 241; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II 221; Griseb. in Ldb. Fl. Ross. IV 428. - *C. Halleriana* v. *ambigua* Hartm. Scand. Fl. ed. 4 (1843), sec. Fr. - Exs.: Fries, Herb. Norm. fasc. X. No 95.

Perennial. Culms 100-150 cm tall, slender, usually unbranched. Panicle narrow, contracted; spikelets lanceolate, slightly colored; glumes narrowly lanceolate, long-acuminate; lemma much shorter than the glumes, awned from the upper part, the awn straight, exceeding the lemma by 1-2 mm;

* [Now in the U. S. S. R.]

callus hairs about 1/2 as long as the lemma, but some of the hairs reaching the tip of lemma and some quite short; extension of rachilla rather well developed, rarely lacking.

Often occurring in forests, in regions where the two species grow together. - European part: Lad. - Il'm., Volg. - Kam., Mid. Dnep., Volg. - 227 Don., West. Siberia: Upp. Tob. Gen. Distr.: Scand., Centr. Eur. Described from Germany.

51. *C. brachytricha* Steud. Syn. Pl. gram. (1855) 189. - *C. varia* Turcz. Fl. baic.-dahur. II, 2 (1856). - *C. silvatica* Maxim. Prim. fl. amur. (1859) 323 ex parte. - *C. varia* var. *longearistata* Korsh. in A. H. P. XII (1892) 420.

Perennial. Tufts dense; rhizome short-creeping; culms 60-100 cm tall, glabrous, rather smooth; unbranched. Leaf sheaths rather short-pilose, more rarely glabrous, scabrous; leaves linear, long-acuminate, leaves of the culm up to 1 cm broad, those of the innovations narrow, long, often more or less folded; ligule 2-3 mm long. Panicle 12-18 cm long, contracted, many-flowered, with very scabrous branches; spikelets ca. 5 mm long, lanceolate, purplish; glumes lanceolate, equal, scaberulous; lemma ca. 4 mm long, elongate-lanceolate, serrate at the summit, awned from near the base, the awn geniculate, to 7 mm long, callus hairs 1/3-1/2 as long as the lemma; extension of rachilla stipelike, ca. 1.5 mm long, with hairs 1.5-2.5 mm long. June-September. (Plate XVI, Figure 8, b-d).

Wooded dry slopes, often among oaks. - East. Siberia: Ang. - Sayan., Daur., Far East: Ze. - Bur., Ussur. Gen. Distr.: Mong., Jap. - Chin. Described from Japan. Type in Switzerland.

NOTE. A species closely related to *C. arundinacea* (L.) Roth., and replacing it in the Far East.

52. *C. Turczaninowii* Litw. in Sched. ad Herb. Fl. Ross. VIII (1918-22) 31 (nomen); id. in Not. Syst. ex Herb. Horti Bot. Petrop. II (1921) 115 (descriptio). - *Calamagrostis varia* Turcz. Fl. baic.-dahur. II, 2 (1856) 313 (non Host). - *C. varia* var. *longearistata* Korsh. in A. H. P. XII (1892) 420.

Explanation to Plate XVI

1. *Calamagrostis lapponica* (Willd.) Hartm.: a) inflorescence; b) glumes; c) extension of rachilla; d) lemma. - 2. *C. obtusata* Trin.: b) glumes; c) extension of rachilla; d) lemma. - 3. *C. chalybaea* Trin.: b) glumes; c) extension of rachilla; d) lemma. - 4. *C. Pavlovii* Roshev.: b) glumes; c) extension of rachilla; d) lemma. - 5. *C. sachalinensis* Schm.: a) inflorescence; b) glumes; c) extension of rachilla; d) lemma. - 6. *C. aleutica* Trin.: b) glumes; c) extension of rachilla; d) lemma. - 7. *C. arundinacea* (L.) Roth.: b) glumes; c) extension of rachilla; d) lemma. - 8. *C. brachytricha* Steud.: b) glumes; c) extension of rachilla; d) lemma. - 9. *C. Turczaninowii* Litw.: a) inflorescence; b) glumes; c) extension of rachilla; d) lemma. - 10. *C. Korotkyi* Litw.: b) glumes; c) extension of rachilla; d) lemma. - 11. *C. monticola* V. Patr.: a) inflorescence; b) glumes; c) extension of rachilla. - 12. *C. purpurascens* R. Br.: b) glumes; c) extension of rachilla; d) lemma. - 13. *C. wiluica* Litw.: a) inflorescence; b) glumes; c) extension of rachilla; d) lemma. - 14. *C. Andrejewi* Litw.: b) glumes; c) extension of rachilla; d) lemma. - 15. *C. caucasica* Trin.: b) glumes; c) extension of rachilla; d) lemma. - 16. *C. iberica* (Griseb.) Litw.: a) inflorescence; c) extension of rachilla; d) lemma.



Perennial. Tufted; rhizome short-creeping; culms 50-80 cm tall, unbranched, glabrous; leaf sheaths rather glabrous. Leaves linear-lanceolate, long-acuminate, to 1 cm broad, very scabrous; ligule to 5 mm long. Panicle 7-15 cm long, contracted, erect, dense, green or purple, ca. 5 mm long; glumes narrowly lanceolate, acuminate, subequal; lemma ca. 4 mm long, serrate at summit, awned from the lower 1/4, the awn geniculate, 7-9 mm long; callus hairs unequal, to 1.5 mm long; extension of rachilla ca. 1-2 mm long, with hairs 3-3.75 mm long. July-August. (Plate XVI, Figure 9, a-d).

- Stony slopes and stone drifts. -East. Siberia: Len. -Kol. (southern part), Ang. -Sayan., Daur.; Far East: Ze. -Bur., Ussur. Gen. Distr.: Mong., Jap. -Chin. Described from Zabaikal'e [Transbaikal]. Type in Leningrad.
 228 53. *C. Korotkyi* Litw. in Sched. ad Herb. Fl. Ross. VIII (1918-22) 31. -*C. silvatica* Rgl. et Tiling, Fl. Ajanensis (1859) 127, No 332. - Exs.: HFR No 2750.

Perennial. Forming compact tufts; rhizome short-creeping; culms unbranched, to 80 cm tall, glabrous; leaves linear-lanceolate, flat, to 10 mm broad, green, scabrous; sheaths of upper leaves scabrous; ligule to 5 mm long, obtuse. Panicle narrow, spike-like, interrupted below, to 15 cm long, with very scabrous branches; spikelets large, to 7-9.5 mm long, narrowly lanceolate, green, fairly purplish; glumes narrowly lanceolate, long-acuminate, somewhat unequal; lemma 5-5.5 mm long, narrowly lanceolate, serrate at summit, awned from slightly above the base, the awn to 11 mm long, geniculate, twisted below; callus hairs ca. 2-2.5 mm long, 1/3-1/2 the length of lemma; extension of rachilla stipelike, 1-2 mm long, with hairs to 5 mm long. June-August. (Plate XVI, Figure 10, a-c).

Wooded slopes. -East. Siberia: Daur.; Far East: Okhot. Endemic. Described from Eravinsk Lake. 1912. Korotkii. Type in Leningrad.

54. *C. monticola* V. Petr. in Bull. Jard. Princ. Bot. URSS (1931) 197. -*Id.*: Kom. and Alis. Oprod. (Determin.) I (1931), tab. 49. -*V. gornyi* [mountainous].

Perennial. Tufted; rhizome short-creeping; culms 40-50 cm tall, 4-noded, slender, smooth; leaves linear, long-acuminate, to 4 mm broad and 5-15 cm long, glabrous, ligule to 3 mm long, rather obtuse. Panicle short, few-flowered, loose, ca. 4 cm long and 2 cm broad, green or somewhat purplish; spikelets ca. 6 mm long, lanceolate; glumes narrowly lanceolate, acuminate, scabrous, about equal; lemma ca. 5 mm long, lanceolate, serrate at the summit, awned from slightly above the base, the awn ca. 9 mm, geniculate, twisted below; callus hairs ca. 1 mm long, varying in length; extension of rachilla stipelike, ca. 3 mm long, with hairs ca. 2 mm long. August. (Plate XVI, Figure 11, a-c).

Edges and projections of rocky precipices. -Far East: Ussur. Endemic. Described from Suchan District, Hualaza Knoll, northern slope, 5 August, 1921, No 465. I. Shishkin. Type in Leningrad.

55. *C. purpurascens* R. Br. in Richards. Bot. App. Frankl. Journ. III (1823) 731. -*Deyeuxia purpurascens* Kunth, Revis. Gram. I (1835) 77. -*C. arundinacea* var. *purpurascens* Osterf. Fl. arct. I (1902) 103. -*C. sylvatica* Trautv. in A. H. P. V I (1877) 142 (non DC). -*C. sylvatica* var. *americana* Vasey, Monogr. Grass. U.S. in Contrib. U.S. Nat. Herb. III (1892) 83. -*C. Czekanowskiana* Litw. in Not. syst. Herb. Horti Bot. Petrop. II (1921) 117.

Perennial. Tufted; rhizome short-creeping; culms 20–50 cm tall, unbranched, glabrous, surrounded at base by sheaths of old leaves; leaves narrowly lanceolate, 3–5 mm broad, flat or subinvolute, those of the innovations longer than those of the culm, scabrous; ligule 2–4 mm long.

229 Panicle spikelike or oblong, 3–8 cm long and 1 cm broad, often interrupted, with very scabrous branches; spikelets 5–6.5 mm long, more or less purplish; glumes broadly lanceolate, scabrous, subequal; lemma 4–4.5 mm long, lanceolate, serrate at the summit, awned from the lower 1/4 or 1/5, the awn long, geniculate, twisted below, much exerted; callus hairs few, scarcely attaining 1/4 the length of the floret; extension of rachilla reaching 1/2 the length of lemma, with hairs to 3 mm long. July–August. (Plate XVI, Figure 12, b–d).

Stony tundra. – Arctic: Arct. Sib., Chuk., Anad.; East. Siberia: Len. – Kol.; Far East: Kamch., Okhot. Gen. Distr.: Bering., N. Am. Described from Arctic America. Type in London.

56. *C. wiluica* Litw. in V. Petr., Fl. Jakut. I (1930) p. 193. – Ic.: ibid., fig. 63.

Perennial. Forming compact tufts; culms 80–100 cm tall and to 3 mm thick, 3-noded, smooth, surrounded at the base by sheaths of old leaves; leaves narrowly linear, to 3 mm broad, scabrous, more or less folded; ligule to 5 mm long. Panicle 8–10 cm long, broadly cylindrical, dense, compact, many-flowered, interrupted below, with short, very scabrous branches; spikelets to 6 mm long, not colored, turning straw-yellow; glumes with central nerve only, subequal, scabrous; lemmas to 5 mm long, lanceolate, serrate at the summit, awned from the lower 1/3, the awn long, geniculate, twisted below, considerably exceeding the lemma; callus hairs scarcely attaining 1/4 the length of lemma; extension of rachilla attaining 1/2 the length of lemma, with hairs to 3 mm long. August. (Plate XVI, Figure 13, a–d).

Bare sandy banks. – East. Siberia: Len. – Kol., Endemic. Described from the Vilyuisk region, at the river Kuchchugei-Batobii, right tributary of Vilyui, 12 August, 1914, No 619, V. Drobov. Type in Leningrad.

57. *C. Andrejewi* Litw. in Sched. ad Herb. Fl. Ross. VII (1911)

157. – *Calamagrostis arundinacea* Roth. *X obtusata* Trin ex Litw., l. c., p. 85. – Exs.: HFR No 2199.

Perennial. Rhizome short-creeping; culms 70–100 cm tall, unbranched; leaves flat, scabrous, to 6 mm broad, with smooth or scaberulous sheaths; ligule ca. 2 mm long, lacerate. Panicle to 20 cm long, narrow, contracted, with very scabrous branches; spikelets ca. 4 mm long, lanceolate, green or more or less purplish; glumes somewhat unequal, glabrous; lemma ca. 3.5 mm long, broadly lanceolate, awned from slightly above the base, the awn geniculate, slightly twisted below, usually somewhat longer than the lemma; callus hairs unequal, to 2 mm long; extension of rachilla ca. 1 mm long, with hairs to 2 mm long. July. (Plate XVI, Figure 14, b–d).

230 Forest clearings and wooded slopes. – European part: Volg. – Kam.; West. Siberia: Ob. region; East. Siberia: Ang. – Sayan. Endemic. Described from the Ust Sysolsk [Syktyvkar] region, nr. Morgino. 8 July, 1909, V. D. Andreev. Type in Leningrad.

58. *C. caucasica* Trin. in C. A. Mey. Verzeichn. (1831) 15. – *C. montana* Auct. fl. cauc. – *C. varia* Auct. fl. cauc. ex parte. – *C. varia* var. *asiatica* Westb. in sched. – *C. simplex* Boiss. Fl. Or. V (1884) 523.

Perennial. Tufted; rhizome long-creeping; culms 45-70 cm tall, more rarely 15-20 cm (var. *simplex* (Boiss.) Litw.), somewhat ascending; culms and sheaths glabrous; leaves linear, flat, to 4.5 mm broad, smooth underneath, scaberrulous on the upper surface; ligule 3-4 (-5) mm long, more or less lacerate. Panicle narrow, 5-10 cm long, contracted, with short, very scabrous branches; spikelets lanceolate, 5-6 mm long, whitish-pink or purplish. Glumes lanceolate, acuminate, subequal; lemma ca. 4 mm long, serrate or aristate-serrate at the summit, awned from near the base, the awn geniculate, slightly twisted below, about 1/2 as long as the body; callus hairs slightly exceeding 1/2 the length of the floret; extension of rachilla ca. 3/4 mm long, with hairs to 2 mm long. June-August. (Plate XV, Figure 15, b-d).

Mountain slopes. -Caucasus: Ciscauc. (mountainous part), Dag., East. Transcauc. Endemic. Described from the peak of Mount Tufandag, 3,200 m. K.A. Meier. Type in Leningrad.

59. *C. iberica* (Griseb.) Litw. in Not. Syst. Herb. Hort. Bot. Petrop. I (1921) 117. -*Calamagrostis silvatica* β *iberica* Griseb. in Ldb. Fl. Ross. IV (1853) 426.

Perennial. Tufted (?); culms ca. 50 cm tall; leaves ca. 3 mm broad, flat; ligule ca. 2 mm long, lacerate. Panicle ca. 7 mm long, open, with very scabrous branches; lemma ca. 3.25 mm long, awned from the basal 1/6-1/7 of the back, the awn strong, geniculate, twisted below, slightly exceeding the lemma; palea somewhat longer than the lemma, 3.5 mm long; callus hairs rather copious, 1/2 as long as the floret; extension of rachilla strong, ca. 1 mm long, the long hairs reaching the tip of the floret. (Plate XVI, Figure 16, a, c, d).

Caucasus: East. Transcauc. Described from Azerbaijan. Type in Leningrad.

Genus 120. PAPPAGROSTIS* ROSHEV, Gen. nov.

Roshev., in Addenda p. 749

231 Panicle narrow, spikelike. Spikelets 1-flowered, narrowly lanceolate. Glumes narrowly lanceolate, longer than the lemma and palea. Lemma thin, subhyaline, bilobed at the summit, awned from the notch, a crown of long hairs arranged round the lobes. Palea as long as the lemma, short-bidentate, with two cillialate keels; lodicules small. Stamens 3, with anthers to 1 mm long. Stigmas short-plumose. Caryopsis oblong-ovoid, naked.

1. *P. pappophorea* (Hack.) Roshev. comb. nova. -*Calamagrostis pappophorea* Hack. in Ann. Conserv. et Jard. Bot. Geneve, July-August (1905) 325.

* From Greek pappos = Pappus, and agrostis = bentgrass.

Perennial. Forming compact tufts; culm 10-25 cm tall, 2-noded, slender, glabrous, unbranched, surrounded at base by sheaths of old leaves; leaves narrowly linear, to 1 mm broad and to 10 cm long, flat or rather involute; ligule oblong, ca. 2 mm long. Panicle oblong-linear, spike-like, to 7 mm long, contracted, with very scabrous branches to 1.5 mm long; spikelets linear-lanceolate, ca. 5.5 mm long, rather motley-colored; glumes subequal, lanceolate, long-acuminate, 3-nerved; lemma 2.5-3 mm long, ovate-lanceolate, hairy all over, bidentate at the summit, with teeth ca. 0.5-0.7 mm long and geniculate awn, twisted below, ca. 7 mm long; the pappus hairs below the awn ca. 3 mm long, silvery. August-September.

Mountains. - Centr. Asia: Tyan'-Shan, Gen. Distr.: Dzung. - Kashg. Described from Chuguchak Valley, in the Tyan'-Shan Mountains, 2,300-3,800 m. Type in Geneva.

Genus 121. AMMOPHILA* HOST

Host, Gram. austr. IV. (1809) 24.

Inflorescence a contracted, spike-like panicle, not spreading out even at anthesis. Spikelets rather large, narrowly lanceolate. The lower glume somewhat shorter than the upper. Lemma and palea slightly shorter than the glumes. Rachilla prolonged beyond the floret, with a tuft of hairs at the end. Fairly large perennials with branched rhizomes.

1. *A. arenaria* (L.) Link, Hort. Berol. I (1827) 105. - Shmal'g. Fl. II, 610. - *Arundo arenaria* L. Sp. Pl. (1753) 82. - *Calamagrostis arenaria* Roth, Tent. Fl. Germ. I (1788) 34. - *Psamma arenaria* Roem. et Schult. Syst. Veg. II (1817) 845; Griseb. in Ldb. Fl. Ross. IV, 434. - Ic.: Rchb. Ic.: Fl. Germ. I, tab. 42, fig. 1454. - Exs.: HFR No 148.

Perennial. A whitish-green plant, forming compact tufts, with an almost vertical rhizome; culms 60-100 cm tall, glabrous; leaves narrowly linear, to 5 mm broad, involute, with scaberulous sheaths; ligule 1-2.5 cm long, more or less lacetate. Inflorescence to 20 cm long, subcylindrical; spikelets pale straw-yellow, 9-11 mm long; glumes narrowly lanceolate, keeled; lemma emarginate, mucronate at the tip, with hairs 2-3 mm long at the base. June-July, (Plate XVII, Figure 1, a).

Sand dunes. - So far unknown in the U. S. S. R., but the occurrence of the plant in this country is very feasible, as it is to be found along the seaboard of neighboring Finland and Baltic countries. Gen. Distr.: sea coast and sand dunes of Central and Southern Europe, Mediterranean, and North America. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Sometimes used for consolidation of sands and of sandy banks. The rhizomes are used for food in Iceland. Suitable for paper production.

Ammophila arenaria Link. X *Calamagrostis epigeios* Roth ex Asch. et Gr. Fl. Nordostd. Flachl. (1898) 93. - *Ammophila baltica* Link, Hort. Berol. I (1827) 105. - *Psamma baltica* Roem. et Schult. Syst. veg. II (1817) 845; Griseb. in Ldb. Fl. Ross. IV, 434. - *Arundo baltica* Flugge in Schrad. Fl. Germ. I (1806) 223. - Ic.: Flugge in Schrad., l.c., tab. 5, fig.

* From ammos-sand, and philos-loving

3. -Differs from *A. arenaria* in the larger, lanceolate panicle; spikelets usually purple-tinged; glumes subulate-acuminate; the hairs surrounding the base of lemma longer (to 4-5 mm). June-July.

Sand dunes, together with *Ammophila arenaria* and *Calamagrostis epigeios*.

ECONOMIC IMPORTANCE. Same application as for the preceding species.

Genus 122. *APERA** ADANS.

Adans. Fam. II (1763) 495.

Inflorescence as open or contracted panicle. Spikelets small, 1-flowered, with rachilla prolonged beyond the developed floret into a small stipe. The lower glume shorter and narrower than the upper. Lemma 5-nerved, awned from slightly below the summit. Awn 2-3 times as long as the lemma. Palea obtuse, awnless. Annual plants.

1. Panicle open; ligule to 6 mm long. 1. *A. spica-venti* (L.) P. B.
- + Panicle contracted, interrupted; ligule 2-4 mm long. 2.
2. Upper glume tapering into a small awn; base of lemma quite glabrous, callus without short hairs; anthers ca. 1.5 mm long. 2. *A. intermedia* Hack.
- + Upper glume pointed, not awned; callus at the base of lemma with short hairs; anthers 0.4-0.5 mm long. 3. *A. interrupta* (L.) P. B.

- 233 1. *A. spica-venti* (L.) P. B. Agrost. (1812) 151; Griseb. in Ldb. Fl. Ross. IV, 442; Shmal'g. Fl. II, 607; Kryl. Fl. Zap. Sib. II, 227. - *Agrostis spica venti* L. Sp. Pl. (1753) 61. - Ic.: Rchb. Ic. Fl. Germ. I (1834) tab. 32, fig. 1421. - Exs.: HFR, No 447.

Annual. Branching at the base; culms 25-100 cm tall, erect, glabrous; leaves linear-lanceolate, to 5 mm broad, flat; ligule to 6 mm long. Panicle large, to 30 cm long, open, with very scabrous branches; spikelets ca. 2.5 mm long, green or more or less purplish; glumes lanceolate, the lower shorter than the upper; lemma slightly shorter than the glumes, hispid toward the summit, with awn 5-7 mm long. June-July. (Plate XVII, Figure 3, a, b).

Fields, among crops, weed-infested places, and sands. - European part: all regions; Caucasus: Ciscauc., East. and South. Transcauc.; West. Siberia: all regions; East. Siberia: all regions (except the north); Far East: Ussur. (introd.). Gen. Distr.: Scand., Centr. and Atl. Eur., Balk. - As. Min. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. A common weed of winter crops, developing in natural conditions as a winter plant. Fodder value low. In the Caucasus the inflorescences of this plant are used to impart green color to wool.

* From Greek *aperos* - not maimed, as, in comparison with the related genus *Agrostis*, each spikelet has a rudiment of a second flower.

2. *A. intermedia* Hack. in Ann. Nat. Hofmus. Wien. XX (1905) 430. Annual. Branching at the base; culms 10-25 cm tall, erect, glabrous; leaves linear, to 4 mm broad, rather flat; Ligule to 8 mm long, lacerate. Panicle narrow, contracted, dense, lobed, 3-8 cm long, with short, almost smooth or scabrous branches; spikelets whitish-green, ca. 2.5 mm long, lanceolate; glumes acuminate, the upper glume short-awned; lemma very slightly shorter than the glumes, quite glabrous at the base, with awn 3-4 times its length; anthers ca. 1.5 mm long. June-July. (Plate XVII, Figure 5, a, b).

Dry slopes. -Caucasus: Southern Transcauc. Gen. Distr.: Asia Minor, whence described. Type in Vienna.

3. *A. interrupta* (L.) P. B. Agrost. (1812) 151; Griseb. in Ldb. Fl. Ross. IV, 443; Shmal'g. Fl. II, 607. -*Agrostis interrupta* L. Syst., ed. 10 (1759) 872. -*lc.*: Rchb. Ic. Fl. Germ. I, tab. 32, fig. 1419.

Annual. Plant branching at the base; culms 10-50 cm tall, erect, glabrous; leaves linear, acuminate, to 3 mm broad, flat or rather involute; ligule to 4 mm long. Panicle narrow, contracted, interrupted, to 15 cm long, with short, very scabrous branches; spikelets pale green, ca. 2 mm long; glumes lanceolate, the lower shorter than the upper; lemma very slightly shorter than the glumes, with short hairs at the base, hispid toward the summit, with awn 5-8 mm long. April-May. (Plate XVII, Figure 4, a, b).

Fields, sandy places, and as a weed. -Caucasus: Ciscauc., East, and 234 South. Transcauc.; Centr. Asia: Pribalkh., Kara-Kum, Upp. Turkm., Syr.-Dar., Pam. -Al., Tyan'-Shan. Gen. Distr.: Centr. and Atl. Eur., Medit. Described from France. Type in London.

Genus 123. LAGURUS* L.

L. Gen. pl. (1737) 353.

Inflorescence a dense, ovoid or oblong, spikelike panicle. Spikelets 1-flowered, perfect. Glumes narrow, densely pubescent, imparting a fluffy-villous appearance to the entire inflorescence. Lemma prolonged into 2 awn-tips at the summit, the awn long, geniculate awned from the back, Palea with 2 keels. Stamens 3. Pistils short, with plumose stigmas.

1. *L. ovatus* L. Sp. pl. (1753) 81; Griseb. in Ldb. Fl. Ross. IV 444. -*lc.*: Rchb. Ic. Fl. Germ. I, tab. 31, fig. 1415. -*Exs.*: Kneuck. Gram. exs. No 224.

Annual or biennial. Branching at the base; culms 20-60 cm tall, slender, more or less pubescent, rarely glabrous; leaves linear-lanceolate, blades and sheaths soft-pubescent; ligule to 3 mm long; inflorescence 2-4 cm long and to 2 cm broad, fluffy-villous; spikelets ca. 5 mm long; glumes narrow, subsubulate, covered with plumose hairs. Lemma bifid, with long awn-tips at the summit, awned from the back, the awn geniculate, 10-12 mm long. (Plate XVII, Figure 6, a-c).

* From lagoon-hare, and ours-tail.

Dry, sunny places. —Caucasus: East. Transcauc. (indicated by K. Koch for Tiflis). Gen. Distr.: Medit. Described from southern Europe. Type in London.

TRIBE IX. —AVENEAE NEES

Nees in Nova Acta Acad. nat. cur. XIX, Suppl. I (1843) 154. —Avenaceae Kunth. in Mem. Mus. Paris II (1815) 72.

Spikelets 2- to many-flowered, rather distinctly pedicellate, gathered in a contracted, spike-like or open panicle very rarely in a compound, 2-rowed spike. Lemma and palea usually shorter than glumes.

1. At maturity complete spikelets fall off 124. *Holcus* L.
+ At maturity the glumes remain on the inflorescence branches, while the lemmas fall off with the grain 2.
- 237 2. Spikelets 2-flowered, always without a stipelike extension of rachilla 125. *Aira* L.
+ Spikelets 2- to many-flowered, always with a stipelike extension of rachilla above the terminal floret 3.
3. Lemma awned from between the divisions of the bifid summit 136. *Danthonia* DC.
+ Lemma always awned from the back, below the bifid or toothed summit 4.
4. Spikelets forming a compound, 2-rowed spike 135. *Gaudinia* P.B.
+ Spikelets forming a spike-like raceme; the lower floret of the spikelet always awnless 131. *Gaudinopsis* A.E.
- + 4. Inflorescence a contracted or open panicle 5.
5. The upper floret of the spikelet perfect, the lower staminate, with a well developed awn 134. *Arrhenatherum* P.B.
+ All florets of the spikelet perfect, or the upper floret staminate or abortive 6.
6. Spikelets large, 1-3 cm long; caryopsis mostly united with the lemma and palea, always distinctly furrowed 7.
+ Spikelets rarely attaining 1 cm in length; caryopsis free, not furrowed..8
7. Annuals; glumes 7-11-nerved 132. *Avena* L.
+ Perennials; glumes 1-3-nerved 133. *Avenastrum* Jessen.
8. Lemma unevenly toothed at the summit, with 2 serrate lobes, or entire 9.
+ Lemma bifid, bidentate or 2-awned at the summit 11.
9. Awn jointed, its upper part club-shaped 126. *Corynephorus* P.B.
+ Awn not jointed, slender at the end 10.

Explanation to Plate XVII

1. *Ammophila arenaria* (L.) Link., inflorescence, a) spikelet. —2. *Ammophila arenaria* Link. —3. *Apera spica venti* (L.) P.B., inflorescence, a) spikelet, b) lemma. —4. *A. interrupta* (L.) P.B., inflorescence, a) glumes, b) lemma. —5. *A. intermedia* Hack., a) glumes, b) lemma. —6. *Lagurus ovatus* L., inflorescence, a) spikelet, b) glumes, c) lemma.



10. Lemma entire, with a geniculate awn from the back 127. *Vahlodea* Fr.
 + Lemma serrate at the summit, with a straight or bent awn from the back 128. *Deschampsia* P.B.
 11. Lemma of the lower floret awnless; spikelets narrow 130. *Ventenata* Koel.
 + Lemma of all florets always awned; spikelets elliptical-lanceolate 129. *Trisetum* Pers.

Genus 124. *HOLCUS** L.

L. Gen. pl. (1737) 15.

Inflorescence a rather dense panicle. Spikelets 2-flowered, laterally compressed, falling entire in fruit [i.e. disarticulating below the glumes].
 238 Lower floret perfect, awnless, upper floret staminate, awned. Glumes lanceolate, longer than the florets, the lower 1-nerved, the upper 3-nerved; lemma 5-nerved, awnless in the lower floret, short-awned from below the summit in the upper floret; palea as long as the lemma, with 2 keels. Lemma and palea indurate in fruit.

1. Annual; glumes with awn 1-2 mm long 1. *H. setosus* Trin.
 + Perennials; glumes awnless or with a small point 2.
 2. Culms pubescent below the nodes; glumes obtusely acuminate
 2. *H. lanatus* L.
 + Culms glabrous below the nodes; glumes long-acuminate
 3. *H. mollis* L.

1. *H. setosus* Trin. in Mem. Acad. Petersb., ser. 6, V, 2 (1840) 87.
 -*H. annuus* Salzm. in Trin. l.c.; Griseb. in Ldb. Fl. Ross. IV (1853) 410; Boiss. Fl. Or. V, 532; Gross. Fl. Kavk. (Flora of Caucasus) I, 83.

Annual. Culms 20-35 cm tall; leaf sheaths and blades soft-pubescent. Inflorescence dense, many-flowered; spikelets oblong-lanceolate, pale green; glumes pubescent above, ciliate on the keel, the lower short-awned, the upper twice as broad, with awn about as long as the glume. Awn of staminate floret flexuous, longer than the spikelet. May-July. (Plate XVII, Figure 1).

Coastal sands. -Caucasus: Tal. Gen. Distr.: West. and East. Medit. and Balk. -As. Min. Described from Sara Island in the Caspian Sea. Type in Leningrad.

2. *H. lanatus* L. Sp. pl. (1753) 1048; Ldb. Fl. Ross. IV, 410; Boiss. Fl. Or. V, 532; Shmal'g. Fl. II, 611. -*H. lanatus* var. *Notarisii* (Nym.) Asch. et Gr.; Gross. Fl. Kavk. (Flora of Caucasus) I (1928) 83. - Exs.: HFR No 197. Ic.: Rechb. Ic. Fl. Germ. I, tab. 105, fig. 1718-1720.

Perennial. Tufted; culms 30-80 (-100) cm tall, pubescent at the nodes and below them; leaf sheaths and blades pubescent. Panicle to 10 cm long, oblong, rather dense. Spikelets oblong-lanceolate, glaucous-purple (f. *coloratus* Rechb.) or whitish (f. *albiovirens* Rechb.); glumes ca. 4 mm long, finely scaberrulous, ciliate on upper part of the keel, awn-tipped; awn

* From Greek *holkos*-traction, alluding to a plant capable of pulling out from the body splinters, etc.
 The name was applied by Piny to a kind of long-awned grass.

of staminate floret hamous not exceeding the glumes. Caryopsis narrowly lanceolate, ca. 2.5 mm long. July-August. (Plate XVIII, Figure 2).

Dry meadows and slopes, more rarely forests. -European part: Kar. - Lap., Lad., -Il'm., Upp. Volg., Mid. Dnep., Upp. Don., Prichern., Crimea, Low. Don.; Caucasus: all regions except South. Eur., Mediterranean and Balk. -As. Min. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Of little fodder value, although it furnishes a large amount of herbage. Not eaten willingly by livestock on account of the velvety pubescence. Presence of glucosides which, under certain conditions, give rise to prussic acid, has been established (L. M. Krechetovich).

3. *H. mollis* L. Syst. ed. 10 (1759) 1305; Ldb. Fl. Ross. IV, 410; Shmal'g. Fl. II, 611. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 105, fig. 1721. Exs.: HFR No 45.

Perennial. Rhizome creeping, branching. Culms 50-100 cm tall, glabrous, pubescent only at the nodes; leaves linear-lanceolate, to 5 mm broad, villous. Panicle 8-10 cm long, narrowly oblong, not very dense; spikelets lanceolate, whitish or more or less colored, 5-6 mm long; glumes long-acuminate, ciliate only on the keel; awn of the staminate floret geniculate, exserted. June-August. (Plate XVIII, Figure 3).

Dry meadows and scrubs. -European part: Lad., -Il'm., Upp. Dnep., Volg. -Don., Low. Don., Gen. Distr.; Scand., Centr. and Atl. Eur., West. Medit., Balk. -As. Min. Described from Holland. Type in London.

ECONOMIC IMPORTANCE. Of little value as fodder. May be of some importance for consolidation of sands, as its long, creeping rhizomes form a rather dense network near the soil surface. Also suitable for cultivation on peat moors.

Genus 125. AIRA* L.

L. Gen. pl. (1737) 335.

Inflorescence a loose, more rarely contracted panicle. Spikelets with 2 perfect florets, very small; rachilla never prolonged. Glumes longer than the lemma and palea, 1-nerved. Lemma bidentate at the summit, with a geniculate awn from the back. Caryopsis furrowed.

1. Panicle narrow, contracted, almost spikelike 1. *A. praecox* L.
- + Panicle broad, open 2.
2. Spikelets ca. 3 mm long, with pedicels as long, rarely longer 2. *A. caryophylla* L.
- + Spikelets 1.5-2 mm long, pedicels 4 to 8 times as long 3. *A. capillaris* Host.

1. *A. praecox* L. Sp. pl. (1753) 65; Ldb. Fl. Ross. IV, 425; Grossg. Fl. Kavk. (Flora of Caucasus) I, 84. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 94, fig. 1675. -Exs.: Schultz, Herb. Norm. No 2288; Kneucker, Gram. exs., No 24.

* In the writings of Theophrastus and Dioscorides, a name for a weed of wheat fields.

Biennial or annual. Tufted; culms 4-10 (-20) cm tall, slender, glabrous, smooth; leaves narrowly linear, involute. Panicle 1-3 cm long, narrow, contracted, with branches to 1 cm long; spikelets ca. 3 mm long, on rather short pedicels, light green, turning brown; glumes scabrous on the keel; lemma brown, with white hairs at the base; awn ca. 4 mm long, from lower 1/3 of the lemma. April-June. (Plate XVIII, Figure 4, 4a).

Dry sandy places. -European part: indicated for Crimea: Caucasus: Ciscauc. (Taman'). Gen. Distr.: Scand., Centr. and Atl. Eur., West. Medit.; in North America-introduced. Described from Southern Europe. Type in London.

2. *A. caryophyllea* L. Sp. pl. (1753) 66; Ldb. Fl. Ross. IV, 424; Boiss. Fl. Or. V, 529; Shmal'g. Fl. II, 612. -Ic.: Rchb. Ic. Fl. Germ. I, 94, fig. 1676. -Exs.: Schulz, Herb. norm., No 584; Kneucker, Gram. exs. No 22.

Biennial or annual. Tufted; culms 15-30 cm tall, slender, glabrous; leaves narrowly linear. Panicle loose, ca. 7 cm long, with spikelets only at the ends of branches, the lower branches being longer than others; spikelets ca. 3 mm long, usually short-pedicelated; glumes scabrous on the keel; lemma brownish, glabrescent at the base, awned in both florets, awn geniculate, ca. 3 mm long, attached below the middle. May-June. (Plate XVIII, Figures 5, 5a).

Dry sandy slopes. -European part: recorded for Upp. Dnep. and Crimea; Caucasus; West. Transcauc. Gen. Distr.: Scand., Centr. and Atl. Eur., West. and East. Medit., Balk. -As. Min. Described from England. Type in London.

3. *A. capillaris* Host, Gram. Austr. IV (1809) 20, tab. 35; Boiss. Fl. Or. V, 529; Shmal'g. Fl. II, 612. -*A. elegans* Willd. in Gaud. Agrost. Helv. I (1811) 130; Ldb. Fl. Ross. IV, 425. -Ic.: Rchb. Ic. Fl. Germ. I tab., fig. 1677. -Exs.: HFR No 2713; Fl. exsic. Austro-Hung. No 1095.

Annual. Tufted; culms 10-35 cm tall, slender, smooth; leaves narrowly linear. Panicle loose, to 8 cm long, its branches capillary, the lower not longer than others; spikelets 1.5-2 mm long, with pedicels 4-8 times as long; glumes short-acuminate; lemma brownish, with white hairs at the base, in upper floret always with a geniculate awn, in lower floret awnless or, more rarely, awned (var. *ambigua* (De Not.) Asch. et Gr.; f. *biaristata* Thaisz.). May-July. (Plate XVIII, Figures 6, 6a).

Dry, sandy places. -European part: Crimea; Caucasus: Gr. Cauc., West. and East. Transcauc. Gen. Distr.: Medit. and Balk. -As. Min. Described from Austria. Type in Vienna.

Genus 126. CORYNEPHORUS* P.B.

P.B. Agrost. (1812) 90, tab. 17, fig. 2 (Nomen conservandum) - *Wiegandertia* Bernh. Syst. Vent. Erf. I (1800) 23, 51.

Inflorescence a rather loose panicle. Spikelets small, 2-flowered, perfect, laterally compressed. Glumes lanceolate, about equal, longer

* From Greek *koryne*-club, and *phorin*-to carry.

241 than the floret. Lemma acuminate, hairy at the base, with a jointed, straight awn from the back; the awn with a ring of hairs at the joint, the upper part brown, thicker than the lower, club-shaped. Palea 2-4-lobed at the summit.

1. Perennial; radical leaves numerous, aggregate in clusters 1. *C. canescens* (Bernh.) P.B.
 + Annual; radical leaves not numerous, not clustered 2. *C. articulatus* (Desf.) P.B.

1. *C. canescens* (Bernh.) P.B. Agrost. (1812) 90, tab. 18, fig. 2; Ldb. Fl. Ross. IV, 423; Shmal'g. Fl. II, 612. -Weingaertneria *canescens* Bernh. Fl. Erf. (1800) 51. -Ic.: Rchb. Ic. Fl. Germ. I tab. 94, fig. 1674. -Exs.: HFR No 196; Fl. Exsicc. Austro-Hung. No 697.

Perennial. Growing in clustered tufts; culms 15-35 cm tall, slender, glabrous; leaves narrowly linear, setaceous-folded; ligule ca. 3 mm long. Panicle 2-8 cm long, rather contracted, with short branches; spikelets ca. 3 mm long, pale green or pinkish. Glumes lanceolate, scabrous on the keel. Lemma with silvery hairs ca. 0.2 mm long at the base, awned from near the base. June-July. (Plate XVIII, Figure 7).

Sandy places. -European part: Upp. Dnep., Mid. Dnep. (?), Prichern. (?). Gen. Distr.: Scand., Centr. and Atl. Eur., West. Medit. Described from France. Type in Paris.

2. *C. articulatus* (Desf.) P.B. Agrost. (1812) 52; Ldb. Fl. Ross. IV 424. -*Aira articulata* Desf. Fl. Atl. I (1798) 70. -Weingaertneria *articulata* Asch. et Gr. Syn. II (1899) 301. -Exs.: Schultz, Herb. normale No 767.

Annual. Growing in clusters; culms 10-35 cm tall, slender, smooth, often branching at the base; leaves narrowly linear, setaceous-involute; ligule to 8 mm long. Panicle 5-15 cm long, open, many-flowered, with rather long branches, spikelets 4-5 mm long, usually purplish; glumes subequal, long-acuminate; lemma with silvery hairs ca. 0.5 mm long at the base, awned from near the base. April-May.

Seaboard sands, rarely penetrating inland. -European part: Mid. Dnep. (introduced?); Caucasus: East. Transcauc., Tal. Gen. Distr.: West. and East. Medit. and Balk. -As. Min. Described from Western Europe. Type in Paris.

Genus 127. VAHLODEA* FRIES

Fries in Bot. Not. (1842) 141 et 178.

242 Inflorescence paniculate. Spikelets with 2-3 perfect florets. Glumes scaphoid, twice as long as the floret. Lemmas coriaceous, ultimately somewhat cartilaginous, acuminate, entire. Lemma awned from the back, awn geniculate, twice as long as the lemma. Palea about as long as the lemma, with 2 keels.

1. Leaves 1-3 mm broad, often folded, glabrous or glabrescent; hairs surrounding the base of lemma attaining 1/2-2/3 of its length. 1. *V. atropurpurea* (Whlbg.) Fries.

* Named for the Danish botanist Martin Vahl, 1749-1804.

+ Leaves 2-5 mm broad, flat, velutinous; hairs surrounding the base of lemma not attaining 1/2 its length
 2. *V. paramushirensis* (Kudo) Roshev.

1. *V. atropurpurea* (Whlbg.) Fries in Bot. Not. (1842) 178. - *Aira atropurpurea* Whlbg. Fl. Lapp. (1812) 37. - *Deschampsia atropurpurea* Scheele in Regensb. Fl. I (1844) 56; Ldb. Fl. Ross. IV, 423. - Exs.: HFR No 2714; Kneuck., Gram. exs. No 572 (sub *Deschampsia*).

Perennial. Growing in small tufts; culms 15-35 cm tall, slender, smooth; leaves narrowly linear, to 3 mm broad, glabrous or glabrescent. Ligule ca. 2 mm long. Panicle loose, 3-7 cm long, branches spikelet-bearing only at their ends, puberulent; spikelets 5-5.5 mm long, more or less purple-colored, rarely whitish (f. *albida* Zinserl); glumes broadly lanceolate, acuminate; lemma ca. 2.5 mm long, blunt, the hairs at the base attaining 1/2-2/3 of its length; awns not exserted. July-August. (Plate XVIII, Figure 8).

Meadows and borders of water reservoirs, in the tundra. - Arctic: Arct. Eur.; European part: Kar. - Lap., and Dv. - Pech. Gen. Distr.: Scand. Described from Lapland. Type in Sweden.

2. *V. paramushirensis* (Kudo) Roshev. nova. in Addenda p. 750. - *Deschampsia atropurpurea* Var. *paramushirensis* Kudo in Journ. Coll. Agr. Hokkaido Univ. Sapporo XI, 2 (1922) 71. - *Vahlodea atropurpurea* subsp. *paramushirensis* Hulten in Fl. of Kamtch. I (1927) 111. - *Deschampsia atropurpurea* Ldb. Fl. Ross. IV 423 ex parte; Kom. Fl. poluostr. Kamch. [Com. Fl. of Kamchatka Peninsula] I (1927) 154.

Perennial. Rhizome creeping; rarely tufted; culms 15-40 cm tall, erect, smooth; leaves 2-5 mm broad, velutinous; ligule ca. 2 mm long. Panicle open, 7-12 cm long, branches strongly pubescent, especially in their upper part; spikelets ca. 5 mm long, greenish or more or less purplish; glumes broadly lanceolate, acuminate; lemma ca. 2-2.5 mm long, more or less acuminate, the hairs at base not attaining 1/2 its length; awns not exserted. July-August.

Well drained meadows, at the upper limit of *Betula Ermani*. - Far East: Kamchatka. Gen. Distr.: Kuril Islands and Bering. Described from Kuril Islands. Type in Tokyo.

Inflorescence a rather open, more rarely contracted, panicle; spikelets 2-3-flowered, perfect. Glumes membranaceous, unequal, as long as the floret or slightly longer. Lemma toothed at the summit, obtuse, surrounded by hairs at the base, awned from the back.

1. Awn of lemma geniculate, twisted below, much longer than the spikelet (Section *Avenaria* Rehb.) 1. *D. flexuosa* (L.) Trin.

* Named for Dr. Deschamps, naturalist of expedition arranged in the search for Lapeyrouse.

- + Awn of the lemma straight or slightly bent, very rarely much longer than the spikelet (Section *Campelia* (Kunth) Griseb.). 2.
2. Panicle strongly contracted, almost spike-like 12. *D. koelerioides* Rgl.
- + Panicle open, not spike-like 3.
3. Awn of lemma very long, much exserted spikelet 4.
- + Awn of the lemma scarcely exserted 5.
4. Panicle oblong-ovoid; spikelets 5-5.5 mm long; a plant of Eastern Siberia 5. *D. Turczaninowii* Litw.
- + Panicle narrow, more or less contracted; spikelets 6-7 mm long; a plant of Baltic countries 7. *D. bottnica* (Whlb.) Trin.
5. Spikelets large, 5-7 mm long 6.
- + Spikelets small, not exceeding 5 mm in length 9.
6. Callus hairs reaching the middle of lemma; a plant occurring only in the extreme north-east of Asia 11. *D. beringensis* Hult.
- + Callus hairs usually not exceeding 1 mm in length 7.
7. Culms rather uniformly leafy, without a cluster of radical leaves; panicle loose, to 20 cm long, with branches to 10 cm long 8. *D. obensis* Roshev.
- + Culms with a cluster of radical leaves at base, leafless or only with short leaves above 8.
8. Awn of the upper floret attached close to the summit of lemma 9. *D. alpina* (L.) Roem. et Schult.
- + Awn attached on the lower 1/4 of lemma in all florets 10. *D. arctica* (Spreng.) Schischk.
9. Leaves thin, setaceous-involute. Caucasus 3. *D. media* (Gouan) Roem. et Schult.
- + Leaves narrowly linear, flat or folded 10.
- 244 10. Awn much shorter than the lemma or lacking; spikelets light green, turning golden; only in Pamir 13. *D. pamirica* Roshev.
- + Awn about as long as the lemma; spikelets more or less colored 11.
11. Lemma awned from near the base 2. *D. caespitosa* (L.) P.B.
- + Lemma awned from the middle or somewhat lower down 12.
12. Plant rarely attaining 50 cm in height; radical leaves short; occurring in polar and subpolar countries 4. *D. borealis* (Trautv.) Roshev.
- + Plant attaining 1 m in height; radical leaves long; occurring in the southern part of Eastern Siberia and of the Far East 6. *D. Sukatschewii* (Popl.) Roshev.

Section 1. *Avenaria* Rchb. Fl. Germ. exc. (1830) 50. - *Avenella* Bluff et Fingerh. Comp. Fl. Germ., ed. 2, I, 1 (1836) 130. - Awn of lemma geniculate, twisted below, much exserted.

1. *D. flexuosa* (L.) Trin. in Bull. Ac. Petersb. I (1836) 66; Ldb. Fl. Ross. IV, 420; Shmal'g. Fl. II, 613; Boiss. Fl. Or. V, 513; Kryl. Fl. Zap. Sibiri (Fl. West. Siberia) II, 229. - *Aira flexuosa* L. Sp. pl. (1753) 65. - Ic.: Rchb. Ic. Fl. Germ. I. tab. 95, fig. 1678, 1679. - Exs.: Meisn. Herb. Fl. Ingricae No 781; HFR No 2708.

Perennial. Growing in loose tufts; rhizome short-creeping; culms 30-60 cm tall, slender, smooth; leaves slender setaceous. Panicle loose, contracted after anthesis; spikelets ca. 5 mm long, brownish, more rarely whitish (var. *umbrosa* (Wimm.) Litw.); glumes hyaline, 1-nerved, longer than florets; awn from the back 1.5 times as long as the lemma; lower

specimens with short leaves and a contracted panicle are often distinguished, such as var. *montana* (L.) Rchb. June-August. (Plate XVIII, Figure 9).

Dry meadows, forests, and coppices. -Arctic: Arct. Eur., Arct. Sib. (Northern Ural); European part: Kar., Lap., Dv., Pech., Lad., Il'm., and Upp. Volg.; Caucasus—all regions in the alpine and subalpine zones, except Tal.; West. Siberia: Ob. region, Berezovka Raion; East. Siberia: surroundings of Yeniseisk; Far East: Kamch., Ud. region, Sakh. Gen. Distr.: Scand., Centr. and Atl. Eur., Medit., Balk. -As. Min., Jap. -Chin., and N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. In pine forests, heaths, felling areas, clearings, and glades, it serves occasionally as a pasture grass. It is gathered for use as packing material and for filling of mattresses (hair substitute).

- 245 Section 2. *Campellia* (Kunth) Griweb. Spicil. Fl. Rum. II (1844) 457; -*Campellia* Kunth, Enum. Pl. I (1833) 286 et 287; *Campella* Link, Hort. berolin. I (1827) 122; -*Campella* Aschers. Fl. Brandenb. I (1864) 832, as a section. -Awn of lemma straight or somewhat bent, sometimes slightly twisted in lower part.

Series 1. *Caespitosae* Roshev. -Spikelets small, not exceeding 5 mm in length. Mainly plants of the forest belt of Eurasia, penetrating into the Arctic Zone.

2. *D. caespitosa* (L.) P. B. Agrost. (1812) 160; Ldb. Fl. Ross. IV, 421, 531; Shmal'g. Fl. II, 613; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 229. -*Aira caespitosa* L. Sp. Pl. (1753) 64. -*lc.*: Rchb. Ic. Fl. Germ. I tab., f. 1682-1686. -*Exs.*: HFR No 95 et 2709; Kneuck. Gram. exs. No 229.

Perennial. Forming compact tufts; culms 20-70 cm tall, more rarely to 125 cm (var. *altissima* Asch.), erect, smooth; leaves narrowly linear, flat or rather involute (var. *setifolia* Koch), the radical leaves often short (var. *brevifolia* Hartm.); ligule to 8 mm long. Panicle open, more rarely contracted (var. *montana* Volk.), with scaberulous branches. Spikelets 3.5-5 mm long, 2-3-flowered, more or less purple, rarely whitish (f. *pallida* Koch) or golden (f. *aurea* Wimm.); glumes lanceolate, unequal; lemma awned from near the base; awn straight, rarely exceeding the floret. June-July. (Plate XVIII, Figure 14).

Meadows and river banks; often forming entire meadows. -Arctic: Arct. Eur.; European part: all regions; West. Siberia: all regions; East. Siberia: all regions; Centr. Asia: Dzung. -Tarb., Syr-Dar., Tyan'-Shan. Gen. Distr.: all Europe, Arm. -Kurd., Iran, Ind. -Him., Dzung. -Kashg., Mong., and N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Readily eaten by livestock until seed ripening, then becoming coarset. Gives a good cut, but of little nutritive value. Undesirable in meadows because of hassock formation. Sometimes considered as a weed. Straw suitable for hat making, being thin and pliable.

3. *D. media* (Gouan) Roem. et Schult. II (1817) 687; Grossg. Fl. Kavk. (Fl. of Cauc.) I, 85. -*Aira media* Gouan, Illustr. (1773) 3. -*Aira subaristata* Faye in Anderss Walp. Ann. VI. (1851) 992. -*lc.*: Rchb. Ic. Fl. Germ. I (1835), tab. 95, f. 1681 (sub *Aira uliginosa*). -*Exs.*: Kneucker, Gram. exs., No 331.

Perennial. Tufted; culms 30-80 cm tall, scaberulous above; leaves slender, setaceous-involute, scaberulous; ligule pointed, to 8 mm long. Panicle open, many-flowered, 20-30 cm long, with long branches; spikelets

4-5 mm long, lustrous, with a villous rachilla; glumes unequal, scabrous on the back, the upper longer than the florets; lemma with awn from about the middle, not exceeding the floret, more rarely awnless (var. *subaristata* (Fay) Schmalh.). May-August.

Meadows. -Caucasus: West. Transcauc. Gen. Distr.: Centr. Eur., West. Medit. and Balk. -As. Min. Described from the Iberian Peninsula. Type in London.

- 246 4. *D. borealis* (Trautv.) Roshev. sp. nova in Addenda p. 750. -*Deschampsia caespitosa* var. *borealis* Trautv. in A.H.P. I (1871) 86. -*D. arctica* var. *borealis* Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II (1928) 233. -*D. caespitosa* var. *brevifolia* Kryl. Fl. Alt. (1914) 1607. -*D. caespitosa* f. *minor* et f. *alpina* Kom. Fl. Kamch. I (1927) 152. -*D. caespitosa* subsp. *orientalis* Hult. Fl. Kamch. I (1927) 109. -*Deschampsia caespitosa* var. *gracilis* Schischk. in Kryl. Fl. Zap. Sib. II (1928) 231.

Perennial. Forming small tufts; culms 3-60 cm tall (3-6 cm -var. *glacialis* Roshev.; 25-60 cm -var. *gracilis* Schischk.), more or less ascending, smooth; radical leaves short, flat or more or less folded. Panicle open, ovoid or rather contracted, with short branches; spikelets small, 3-4 mm long, 2-3-flowered, with a rather villous rachilla; glumes somewhat unequal, more or less serrate at the summit; callus hairs 1/4-1/3 the length of lemma; lemma awned from below the middle. June-August.

Meadows, borders of streams and lakes, often on sandy or stony soil. -All Arctic; European part: Kar. -Lap., Dv. -Pech., Lad. -Il'm.; West. Siberia: Ob. region; East. Siberia: Yenisei., Len. -Kol., Ang. -Sayan; Far East: Kamch., Okhot. Gen. Distr.: Arctic, Scand., Bering. Described from Novaya Zemlya. Type in Leningrad.

ECONOMIC IMPORTANCE. Grazed by deer at the beginning of summer.

5. *D. Turczaninowii* Litw. in Sched. Herb. Fl. Ross. VIII (1922) 158. -*Czernaevia melicoides* Turcz. in herb. -*Deschampsia bottnica* Turcz. Fl. baic. -dahur. in Bull. Soc. Nat. Mosc. (1856) 318. -*Aira caespitosa* var. *melicoides* Trautv. in herb. -*Deschampsia caespitosa* var. *melicoides* Griseb. in Ldb. Fl. Ross. IV, (1853) 422. -Exs.: HFR No 2712.

Perennial. Forming compact tufts; culms 20-60 cm tall, erect, glabrous; leaves to 1 mm broad, folded, glabrous; ligule pointed, to 9 mm long. Panicle oblong-ovoid, branches smooth or nearly so; spikelets 2-3 flowered, ca. 5.5 mm long, more or less colored; glumes unequal, the lower acuminate, ca. 3 mm long, the upper crenate, ca. 4 mm long; callus hairs to 1 mm long; lemma awned from the lower 1/4, awn greatly exceeding the body. June-August. (Plate XVIII, Figure 12).

Coastal pebbles. -East. Siberia: Ang. -Sayan, Daur., Endemic. Described from Zabaikal'e [Transbaikal.]. Type in Leningrad.

6. *D. Sukatschewii* (Popl) Roshev. comb. nova -*Aira Sukatschewii* Popl. in "Ocherki po fitosots. i fitogeogr. (Essay on Phytosociology and Phytogeography)", Izd. "Nov. Der.", Moscow, 1929, 379-382. -*Deschampsia caespitosa* var. *microstachya* Roshev. in Fl. Zabaik. I (1929) 67.

Perennial. Tufted; culms 40-100 cm tall, erect, smooth; leaves narrowly linear, flat or mostly folded, glabrous, 8-20 cm long and 2.5-6 mm broad; ligule oblong. Panicle 6-18 cm long, open or rather contracted;

spikelets 2.5-4 mm long, 2-flowered; glumes unequal, rather obtuse, rarely pointed; callus hairs attaining $1/4-1/3$ the length of lemma; lemma awned from about the middle or somewhat lower down. June-August. (Plate XVIII, Figure 15).

Meadows, river banks. -East. Siberia: Len. -Kol., Ang. -Sayan, Daur.; Far East: Ze.-Bur., Ud. region, Ussur. Endemic. Described from East. Siberia. Type in Leningrad.

Series 2. *Bottnicae* Roshev. -Spikelets large, 5-7 mm long. Culm rather uniformly leafy. Plants of the northwestern part of Eurasia.

7. *D. bottnica* (Whlbg.) Trin. Fund. Agrost. (1820) 158; Ldb. Fl. Ross. IV, 422. -*Aira bottnica* Whlbg. Fl. Lappl. (1812) 36. -Exs.: Fl. Finl. exs. No 464.

Perennial. Forming small tufts; culms 50-70 cm tall, more or less erect, quite smooth; leaves rather long, folded or involute, smooth; ligule pointed, ca. 4 mm long. Panicle to 30 cm long, narrow, contracted or, more rarely, somewhat open, branches smooth or nearly so; spikelets 6-7 mm long, yellowish-green, more rarely purplish; glumes about equal, narrowly lanceolate; callus hairs 2-3 mm long; awn from the lower $1/4$, exceeding the lemma by 2 mm. June-July. (Plate XVIII, Figure 11).

Seaboard. -European part: Lad. -Il'm. Gen. Distr.: Scand. Endemic for the northeastern part of the Baltic Sea. Described from the coast of Gulf of Bothnia. Type in Sweden.

8. *D. obensis* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 771. -*Aira caespitosa* var. *grandiflora* Trautv. ex parte in herb. Petrop. -*Deschampsia caespitosa* var. *Wibeliana* auct. ex parte in herb. Petrop.

Perennial. Forming small tufts, sometimes rhizomatous; culms 40-60 cm tall, slender, glabrous, smooth; leaves narrowly linear, 1-2 mm broad, more or less folded, short. Panicle 10-20 cm long, rather loose, branches to 10 cm long, smooth; spikelets 5.5-7 mm long, 2-3 -flowered, with sparingly villous rachilla; glumes 5-7 mm long, narrowly lanceolate, somewhat unequal, more or less serrate at the summit; callus hairs $1/6-1/4$ the length of lemma; lemma awned from near the base, awn slightly bent (seemingly geniculate), scabrous, about as long as the lemma. July-August.

Coastal sands. -Arctic: Arct. Eur. -Kolguev Island, Arct. Sib. -estuaries of Ob and Yenisei. Endemic. Described from Ob estuary. Type in Leningrad.

Series 3. *Alpinae* Roshev. -Spikelets large, 5-7 mm long. Culm surrounded at base by numerous radical leaves, leafless or with short leaves above. Arctic plants.

248 9. *D. alpina* (L.) Roem. et Schult. Syst. II (1817) 686; Ldb. Fl. Ross. IV, 422; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 233 -*Aira alpina* L. Sp. pl. (1753) 65. -*Aira laevigata* Sm. Trans. Linn. Soc. X (1810) 337. -Exs.: Kneucker, Gram. exs., No 226.

Perennial. Tufted; culms 10-35 cm tall, erect, smooth; leaves narrow, involute, rather smooth; ligule pointed, 2-3 mm long. Panicle rather open, to 10 cm long, with smooth, flexuous branches; spikelets 6-7 mm long, whitish or more or less colored; rachilla joints ca. 0.5 mm long, often proliferous (f. *vivipara*); glumes subequal, lanceolate, acuminate; callus hairs very short; lemma awned from below the middle in the lower floret and from near the summit in the upper floret. July-September.

Borders of water reservoirs and tundra. -Arctic: Arct. Eur., Nov. Zem., Arct. Sib. Gen. Distr.: Arctic Zone and Scand. Described from Lapland. Type in Sweden.

ECONOMIC IMPORTANCE. Considered as forage for deer at the beginning of summer.

10. *D. arctica* (Spreng.) Schischk. in Kryl. Fl. Sib. occid. II (1928) 232. -*Aira arctica* Spreng. Syst. veg. IV, 2 (1827) 32. -*Deschampsia brevifolia* R. Br. in Suppl. to the App. of Capt. Parry's Voy. (1824) 191 non *Aira brevifolia* M. B. Fl. taur. -cauc. III (1819) 63; Ldb. Fl. Ross. IV, 422. -*Aira caespitosa* var. *brevifolia* Trautv. in A. H. P. I (1871) 86. -*Deschampsia caespitosa* var. *grandiflora* Trautv. Fl. taimyr. (1847) 19. -*l.c.*: Trin. Spec. Gram. III, tab. 256, fig. A. -*Exs.*: HFR, No 2711 sub *Aira*.

Perennial. Forming compact tufts; culms 20-50 cm tall, more or less erect, smooth; leaves narrow, involute or rather flat; ligule pointed, to 6 mm long. Panicle rather contracted, 6-15 cm long, with smooth branches; spikelets 2-3-flowered, 5-7 mm long, more or less colored; rachilla joints 1-1.5 mm long; glumes subequal, acuminate, nearly as long as the lemma and palea; callus hairs ca. 1 mm long; awn from the lower 1/4, about as long as the lemmas. July-August.

Arctic meadows and tundra. -Arctic: Arct. Eur., Nov. Zem., Arct. Sib. Gen. Distr.: Arctic. Described from Melville Island. Cotype in Leningrad.

ECONOMIC IMPORTANCE. Considered a good pasture plant for deer.

11. *D. beringensis* Hult. Fl. Kamtch. I (1927) 107. -*Aira caespitosa* var. *longiflora* Trin. in Herb. -*Aira grandiflora* Fisch. in Herb. -*Deschampsia caespitosa* var. *brevifolia* Fedtsch., Fl. Res Comm. (1906) 122. -*D. botanica* auct. amer. plur. saltem pro parte. -*D. brevifolia* var. *exserens* Kudo, Fl. Paramush. (1922) 70. -*l.c.*: Hult., *l.c.*, fig. 9 (spikelet).

Perennial. Tufted; culms 25-80 cm tall, more or less ascending, smooth; leaves flat, 1.5-4 mm broad, glabrescent; ligule pointed, to 13 mm long. Panicle 7-20 cm long, rather contracted, yellowish-green; spikelets long, narrow, 2-3-flowered; glumes about equal, 4-5 mm long, narrow, acuminate, 3-nerved; lemma 4-toothed, callus hairs attaining 1/2 its length, awn from near the base slightly longer than the lemma. July-August. (Plate XVIII, Figure 13).

Elevated place on the seacoast. -Arctic: Chuk.; Far East: South. part of Kamchatka and Komandor Islands. Gen. Distr.: Bering. Described from Kamchatka. Type in Sweden (Stockholm).

Series 4. *Koeleriiformes* Roshev. -Spikelets ca. 5 mm long. Panicle dense, spikelike or somewhat open. Mountain regions of Centr. Asia.

12. *D. koelerioides* Rgl. Pl. Semenov in Bull. Soc. Nat. Mosc. XLI (1868) 299; Ej. in A. H. P. VII (1880) 638; Kryl., Fl. Zap. Sib. (Fl. West. Sib.) II 232. -*Deschampsia caespitosa* var. *alpina* Kryl. Fl. Alt. (1914) 1808, non Hoppe.

Perennial. Forming compact tufts; culms glabrous, 7-30 cm long (50 cm - var. *elatio* Rgl.), smooth; leaves narrowly linear, 1-3 mm broad, folded more rarely flat; ligule pointed, 3-7 mm long. Panicle strongly contracted, almost spikelike, more rarely rather loose, 1.5-6 cm long and 1-2.5 cm broad, with short, smooth branches; spikelets ca. 5 mm long, 2-flowered, with a long, villous rachilla; glumes unequal, 3.5-5 mm long;



callus hairs attaining 1/2 the length of lemma; lemma awned from near the base, awn rather straight, exserted, rarely included. July-September. (Plate XVIII, Figures 10, 10a).

Alpine meadows and stony places. -West. Siberia: Alt.; Centr. Asia: Dzung. -Tarb., Pam.-Al., Tyan'-Shan. Type in Leningrad.

252 13. *D. pamirica* Roshev. sp. nov. in Addenda p. 750.

Perennial. Forming small, compact tufts; culms 65-80 cm tall, glabrous, smooth; leaves narrowly linear, 2-4 mm broad. Flat or rather involute, glabrous, smooth underneath, scaberrulous on the upper surface, crowded at the base of the culm; ligule pointed, 5-8 mm long. Panicle 10-15 cm long, oblong, with glabrous, smooth branches to 5 cm long; spikelets large, 4-7 mm long, 2-3-flowered, with a scantily hairy rachilla; glumes 4-5 mm long, subequal, rather obtuse; callus hairs attaining 1/3-1/2 the length of lemma; lemma awned from about the middle or from somewhat below or above the middle awn straight, markedly shorter than the lemma, often rudimentary or lacking. August.

Borders of mountain streams and meadows. -Centr. Asia: Pam.-Al. Endemic. Described from Pamir, Korzhinskii. Type in Leningrad.

Genus 129. TRISETUM* PERS.

Pers. Syn. I (1805) 97.

Inflorescence an open, contracted or, more rarely, spikelike panicle. Spikelets 2-4-flowered, perfect. Glumes unequal, 1-3-nerved. Lemma keeled, bifid or with two awn-tips at the summit and a bent, more rarely geniculate, awn from the back. Palea with 2 keels. Stamens 3. Ovary naked. Stigmas plumose. Perennial, more rarely annual plants.

1. Annuals. Lemma with 2 long awns at the summit 2.
- + Perennials. Lemma with 2 points or short awns at the summit . . . 3.
2. Inflorescence narrowly linear, 8-12 cm long 11. *T. lineare* (Forsk.) Boiss.

* From Greek *tria*-three, and Latin *seta*-bristle.

Explanation to Plate XVIII

1. *Holcus setosus* Trin., spikelet. -2. *H. lanatus* L., spikelet. -3. *H. mollis* L., spikelet. -4. *Aira praecox* L., inflorescence; 4a spikelet. -5. *A. caryophyllae* L., inflorescence; 5a spikelet. -6. *A. capillaris* Host, inflorescence; 6a spikelet. -7. *Corynephorus canescens* (Bernh.) P.B., spikelet. -8. *Vahlodes atropurpurea* (Willd.) Fries, spikelet. -9. *Deschampsia flexuosa* (L.) Trin., spikelet. -10. *D. koelerioides* Rgl., inflorescence; 10a spikelet. -11. *D. bottanica* (Willd.) Trin., spikelet. -12. *D. Turczaninowii* Litw., spikelet. -13. *D. beringensis* Muht., spikelet. -14. *D. caespitosa* (L.) P.B., spikelet. -15. *D. sukatscherii* (Popl.) Roshev., spikelet. -16. *Trisetum lineare* (Forsk.) Boiss., inflorescence; 16a spikelet. -17. *T. Cavanillesii* Trin., inflorescence; 17a spikelet. -18. *T. rigidum* (M.B.) Roem. et Schult., spikelet. -19. *T. distichophyllum* (Vill.) P.B., spikelet. -20. *T. seravschanicum* Roshev., inflorescence and spikelet. -21. *T. virescens* (Rgl.) R. Fedtsch., inflorescence; 21a spikelet. -22. *T. spicatum* (L.) Richt., inflorescence; 22a spikelet. -23. *T. altaicum* Roshev., inflorescence; 23a spikelet. -24. *T. sibiricum* Rupr., inflorescence; 24a spikelet. -25. *T. pratense* Pers., inflorescence; 25a spikelet. -26. *Ventenata dubia* (Leerm.) F. Schulz, inflorescence; 26a spikelet. -27. *Candonopsis macra* (M.B.) Eig., spikelet.

- + Inflorescence ovoid-oblong, to 6 cm long 10. *T. Cavanillesii* Trin.
- 3. Rachilla hairs at least 1/2 as long as the lemma 4.
- + Rachilla hairs less than 1/2 as long as the lemma 5.
- 4. Rachilla hairs nearly as long as the lemma, silvery-white 9. *T. rigidum* (M.B.) Roem. et Schult.
- + Rachilla hairs 1/2 as long as the lemma 8. *T. distichophyllum* (Vill.) P.B.
- 5. Culms always pubescent below the inflorescence 6.
- + Culms always glabrous below the inflorescence 7.
- 6. Inflorescence loose, pale green; plant 20-30 cm tall, tufted 7. *T. seravschanicum* Roshev.
- + Inflorescence rather compact, dense, sometimes interrupted; plant 35-75 cm tall; practically not tufted 6. *T. virescens* (Rgl.) B. Fedtsch.
- 253 ++ Inflorescence rather dense, always more or less colored; plant forming compact tufts; culms 7-30 (-45) cm tall 5. *T. spicatum* (L.) Richt.
- 7. Plants usually to 30 cm tall. Inflorescence rather spikelike 8.
- + Plants from 40 to 150 cm tall; inflorescence rather open 9.
- 8. Leaves bright green, to 4 mm broad, flat, with raised hairs 4. *T. altaicum* Roshev.
- + Leaves grayish-green, ca. 1-2 mm broad, rather involute, glabrous or puberulent 3. *T. subalpestre* (Hartm.) Neum.
- 9. Spikelets 5-10 mm long; awns bent, not geniculate, slightly twisted below 1. *T. pratense* Pers.

1. *T. pratense* Pers. Syn. I (1805) 97; Grossg. Fl. Kavk. (Fl. of Caucasus) I (1928) 86. - *Trisetum flavescens* P.B. Agrost. (1812) 88 sensu lato; Boiss. Fl. Or. V (1884) 537. - *Avena flavescens* L. Sp. pl. (1753) 80 pro parte; Ldb. Fl. Ross. IV, 417 ex parte; Rgl. in A.H.P. VII (1880) 635 ex parte. - Ic.: Rechb. Ic. Fl. Germ. I, tab. 99, f. 1694 - 1696. - Exs.: Fl. Exs. Austro-Hung., No 3497 (sub *Tr. flavescens* L.).

Perennial. Tufts small; culms 30-100 cm tall, slender, smooth, glabrous; leaves to 5 mm broad, hairy; ligule very short. Panicle narrowly oblong, 5-12 cm long, with rather short branches; spikelets 4-6 mm long, 2-5-flowered, more or less golden-colored; glumes acuminate, the lower shorter than the upper; lemma terminating in 2 aristate points, awned from above the middle, awn distinctly geniculate, strongly twisted below, straight above. May-August. (Plate XVIII, Figures 25, 25a).

Dry meadows and forests. - European part: Lad. - Il'm., and Upp. Volg.; Caucasus - all regions; Centr. Asia: Upp. Turkm. Gen. Distr.; Scand., Centr. and Atl. Eur., Medit., Balk. - As. Min., Arm. - Kurd., Iran. Described from Germany.

ECONOMIC IMPORTANCE. A valuable meadow grass, yielding tender, soft, and nutritious fodder, readily eaten by all livestock. Produces good aftergrowth. Yields up to 100-114 centners per hectare. Sometimes sown in lawns, as it forms a good sward subjected to frequent, low cutting.

2. *T. sibiricum* Rupr. Beitr. Pflanzk. Russ. Reich. II (1845) 65; Kom. Fl. Kamch. I (1927) 156; Grossg. Fl. Kavk. (Fl. Cauc.) I (1928) 86; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II 234. - *Trisetum Rupprechtii*

Griseb. in Ldb. Fl. Ross. IV, 418 (quoad var. *litoralis* Rupr.). - *Trisetum flavescens* Auct. (non P.B.); Griseb. l.c. 417 (pro max. parte); - *Avena flavescens* Auct. (non L.); Rgl. in A. H. P. VII (1880) 635; Shmal'g. Fl. II 615 (pro max. parte). - *Trisetum pratense* var. *majus* Asch. et Gr. Syn. II (1899) 267. - l.c.: Kom. and Al. Opred. (Determin.) I (1931) tab. 53. - Exs.: HFR No 796 (sub *Avena flavescens* L.).

- 254 Perennial. Rhizomes short-creeping; culms 50-150 cm tall (20-40 cm tall, with a dense, compact, spikelike panicle-var. *litorale* Rupr.), smooth, leafy; leaves to 9 mm broad; ligule 1-2 mm long. Panicle to 20 cm long, open, rarely rather contracted, dense; spikelets 5-10 mm long, 2-3-flowered, more or less motley-tinged; glumes unequal, acuminate; lemma terminating in 2 short points, awned from the upper 1/3, awn bent (not geniculate), faintly twisted below, recurved near the end. June-July. (Plate XVIII, Figures 24, 24a).

Wet meadows and forests. - Arctic: Arct. Eur., Arct. Sib. and Anad. (var. *litorale* Rupr.); European part: all regions except Crimea and Low. Volg.; Caucasus: Ciscauc., Dag., East. and South. Transcauc.; West. Siberia: all regions; East. Siberia: all regions; Far East: all regions; Centr. Asia: Dzung. - Tarb., Tyan'-Shan; Gen. Distr.: Balk. - As. Min. Mong., Jap. - Chin., N. Am. Described from Belaya River, Siberia, and Kanin Peninsula (var. *litoralis* Rupr.). Type in Leningrad.

ECONOMIC IMPORTANCE. A good forage plant; becomes coarse after flowering.

3. T. subalpestre (Hartm.) Neum. Sver. Fl. (1901) 755. - *Avena subalpestris* Hartm. Handb., ed. 3 (1838), 21. - *Trisetum agrostideum* Fr. Nov. Fl. Suec. Mant. III (1842) 180; Rozhev in Fl. Zabaik. I (1929) 68. - *Avena agrostidea* Fr. l.c. 3; Griseb. in Ldb. Fl. Ross. IV 418. - Exs.: Fr. Herb. Norm. VII (sub *Avena agrostidea* Laest.).

Perennial. Rhizome fibrillose; culms 15-30 (-40) cm tall, glabrous; leaves narrow, rather involute. Panicle rather loose, contracted, 2-5 cm long; spikelets ca. 5 mm long, 2-3-flowered, somewhat tinged; rachilla slender; glumes unequal, the upper longer than the lower; lemma with short teeth at the summit, awned from slightly above the middle. July-August.

Tundra and bare Siberian heights. - Arctic: Arct. Eur. Arct. Sib.; European part: Kar. - Lap.; East. Siberia: Yeniz., Len. - Kol., Daur. (Vitim Plateau); Far East: Okhotsk. (?). Gen. Distr.: Scand. (Lapland). Described from Lapland. Type in Stockholm.

4. T. altaicum (Steph.) Roshev. in Not. Syst. Herb. Horti Bot. Petrop. III (1922) 85. - *Avena altaica* Steph., nom. nudum in herb. Petrop. - *Trisetum agrostideum* Auct. Fl. altaicae et turkestanicae.

Perennial. Forming loose tufts; culms 15-35 (-45) cm tall, ascending, glabrous; leaves bright green, 2-4 mm broad; blades and sheaths villous; ligule to 3 mm long, obtuse. Panicle loose, linear or lanceolate, 4-9 cm long and 1-2 cm broad; spikelets 5-7 mm long, 2-3-flowered, dark purple; rachilla hairy; glumes unequal, the lower 1/4-1/3 shorter than the upper; lemma with 2 points at the summit, awned from slightly above the middle, awn nearly twice as long as the lemma, faintly twisted below. May-November. (Plate XVIII, Figures 23, 23a).

- 255 Alpine and subalpine meadows. - West. Siberia: Alt.; East. Siberia: Ang. - Sayan; Daur.; Centr. Asia: Dzung. - Tarb. Tyan'-Shan. Endemic. Described from Altai. Type in Leningrad.

5. *T. spicatum* (L.) Richt. Fl. Eur. I (1890) 59; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II 236. - *Avena spicata* L. Sp. Pl. (1753) 64. - *Avena subspicata* L. Syst. Nat., ed. 10 (1759) 873; Griseb. in Ldb. Fl. Ross. IV 418. - *Trisetum subspicatum* P.B. Agrost. (1812) 88. - Ic.: Rchb. Ic. Fl. Germ. I tab. 98, fig. 1691. - Exs.: Kneucker, Gram. exs. No 231.

Perennial. Tufted; culm 8-30 cm tall (-45 cm, f. *elatio* Kryl.), leafy up to its middle, glabrous, densely pubescent below the inflorescence or pubescent all over (var. *molle* A. Gray); leaves flat, more or less scabrous or pubescent (var. *molle* Gray). Panicle contracted, spikelike, up to 8 cm long and 12 mm broad; spikelets 5-6 mm long, 2-3-flowered, more or less dark colored, with short-hairy rachilla; glumes unequal, the lower much narrower than the upper; lemma terminating in 2 points, with awn from the upper third, one and a half to twice as long as the floret. June-September. (Plate XVIII, Figures 22, 22a).

Tundra and mountain meadows. - Arctic: all regions; European part: Kar. - Lap., Dv. - Pech., Volg. - Kam. (Ural); Caucasus: Ciscauc., Dag., East. and South. Transcauc.; West. Siberia: all mountainous regions; East. Siberia: all regions; Far East: all regions except Ussur.; Centr. Asia: Dzung. - Tarb.; Pam. - Al., Tyan'-Shan. Gen. Distr.: Arctic, mountains of Europe, Dzung. - Kashg., Mong., Bering., N. Am., Tibet. Described from Lapland. Type in London.

6. *T. virescens* (Rgl.) B. Fedtsch. in Bull. Jard. Bot. Petrop. Suppl II (1914) 64. - *Avena virescens* Rgl. in A.H.P. VII (1880) 635. - *A. flavescens* β *virescens* Rgl. in Bull. Soc. Nat. Mosc. 2 (1868) 299.

Perennial. Forming compact tufts; culms 30-50 (-75) cm tall, slender, glabrous, or pubescent below the inflorescence; leaves linear, to 5 mm broad, flat, blades and sheaths more or less pilose or glabrescent; ligule short. Panicle linear or oblong, spikelike, often interrupted, with branches to 12 mm long; spikelets ca. 5-6 mm long, 2-flowered, short-pedicel, whitish-green or more or less colored (var. *coloratum* Roshev.); glumes terminating in short teeth, with awn from above the middle; awn ca. 5 mm long, bent. June-August. (Plate XVIII, Figures 21, 21a).

Mountain meadows. - Centr. Asia: Dzung. - Tarb., Pam. - Al., Tyan'-Shan. Endemic from Trans-Ali Alatau. Type in Leningrad.

7. *T. seravschanicum* Roshev. in Not. Syst. Herb. Horti Bot. Petrop. III (1922) 88.

256 Perennial. Culms 20-35 cm tall, more or less ascending, glabrous, pubescent only below the inflorescence; leaves narrowly linear, to 2 mm broad; blades and sheaths puberulent; ligule to 2 mm long, rather serrate. Panicle contracted, spikelike, 4-6 cm long and ca. 1.5 cm broad, pale green; spikelets 6-8 mm long, 2-3-flowered; rachilla hairy; glumes unequal, very scabrous on the keel. Lemma terminating in 2 points, awned from above the middle, awn as long as the lemma, bent, somewhat twisted below. June-July. (Plate XVIII, Figure 20).

High-mountain meadows. - Centr. Asia: Pam.-Al. Endemic. Described from the Zeravshan Range. Type in Leningrad.

8. *T. distichophyllum* (Vill.) P.B. Agrost. (1812) 88; Grossg. Fl. Kavk. (Fl. of Cauc.) I, 86. - *Avena distichophylla* Vill. Prosp. (1779) 16; Griseb. in Ldb. Fl. Ross. IV, 417. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 98; fig. 1693. - Exs.: Kneucker, Gram. exs. No 230.

Perennial. Loosely tufted; rhizome creeping; culms 10-20 cm tall, ascending, glabrous; leaves distichous, glabrous or puberulent, 2-3 mm broad; ligule obtuse. Panicle to 6 cm long, contracted, with short branches; spikelets 5-8 mm long, 2-3-flowered; rachilla hairs 1/2 as long as the lemma; glumes subequal, both 3-nerved; lemma terminating in 2 points or short awns, awned from the upper 1/3; awn strongly divergent. July-August. (Plate XVIII, Figure 19).

Rocky places in the alpine zone. -Caucasus: Ciscauc., Dag., East. Transcauc. Gen. Distr.: Alps, Pyrenees, Carpathian Mts. Described from the Alps. Type in Paris.

9. *T. rigidum* (M.B.) Roem. et Schult. Syst. II (1817) 662; Boiss. Fl. Or. V, 538; Grossg. Fl. Kavk. (Fl. of Cauc.) I, 86. -*Avena rigida* M.B. Fl. taur.-cauc. I (1808) 77; Griseb. in Ldb. Fl. Ross. IV, 417; Shmal'g. Fl. II, 615. -*Arundo Wilhelmsii* Ldb. in Mem. Acad. Petersb. VI (1818) 593. -Exs.: Fl. Cauc. ess. No 305.

Perennial. Loosely tufted; culms 30-80 cm tall, slender, glabrous, puberulent only at the nodes and below them; leaves long-acuminate, to 5 mm broad, rather glaucous, glabrous or puberulent, sometimes ciliate on the margin (var. *ciliatifolium* Roshev.); ligule short, lacerate. Panicle silvery, oblong, 7-20 cm long and to 4 cm broad, rarely contracted, ovoid-oblong, to 4 cm long and 1.5-2 cm broad (var. *ovalis* Som. et Lev.); spikelets 7-11 mm long, 2-4-flowered, rachilla hairs about as long as the lemma, protruding from the open floret; glumes unequal, the lower 1-nerved, the upper nearly twice as long, 3-nerved; lemma terminating in 2 points or short awns, awned above the middle, awn much longer than the lemma. May-July. (Plate XVIII, Figure 18).

257 Dry slopes. -European part: Crimea; Caucasus: all regions except Tal. Gen. Distr.: Arm. -Kurd. Iran. Described from Crimea and Caucasus. Type in Leningrad.

10. *T. Cavanillesii* Trin. in Acta Petrop. I (1830) 63; Grossg. Fl. Kavk. I, 86. -*Trisetum Gaudinianum* Boiss. Voy. Bot. Esp. II (1845) 653; Boiss. Fl. Or. V, 535. -*lc.*: Rchb. Ic. Fl. Germ. I, tab. 97 fig. 1589 (sub *Avena Loefflingiana* Cav.). -Exs.: HFR, No 600.

Annual. Growing in small tufts; culms 4-15 (-30) cm tall, slender, smooth; leaves narrowly linear, puberulent, flat or rather involute; ligule 2-3 mm long, pubescent. Panicle spikelike, contracted, 1.5-6 cm long, with short branches; spikelets ca. 6 mm long, 2-flowered, with a hairy rudiment of third floret; glumes unequal, the lower linear-lanceolate, the upper broadly lanceolate; lemma terminating in 2 aristate points, awned from above the middle, awn rather bent, twice as long as the lemma. (Plate XVIII, Figures 17, 17a).

Dry sandy and stony places. -Caucasus: East. and South. Transcauc.; Centr. Asia: Kara-Kum., Upp. Turkm. Syr-Dar., Pam. -Al. Gen. Distr.: Medit., Balk. -As. Min., Arm. -Kurd., and Iran. Described from Spain. Type in Leningrad.

ECONOMIC IMPORTANCE. A good forage grass, but it occurs in small quantity.

11. *T. lineare* (Forsk.) Boiss. Diagn. ser. 1, XIII (1853) 49; Boiss. Fl. Or. V, 536. -*Trisetaria linearis* Forsk. Fl. Aeg. -Arab. (1775) p. LX; Delile Fl. d'Eg. (1813) 29, tab. 12, fig. 3. -*lc.*: Delile l.c. - Exs.: Bornmuller, Iter. Syr. 1897, No 1654.

Annual. Tufted; culms 25-35 cm tall, more or less geniculately ascending, puberulent; leaves narrowly linear, blades and sheaths clothed with short hairs; ligule short, toothed. Panicle narrowly linear, 8-12 cm long and 4-8 mm broad, dense, with short branches, whitish; spikelets 7-8 mm long, 2-flowered; rachilla with short hairs; glumes subequal, linear-lanceolate, 6-8 mm long, both 3-nerved; lemma terminating in two long apical awns, with a long (18-22 mm), straight dorsal awn from the upper third, May-June. (Plate XVIII, Figures 16, 16a).

Sandy desert places. -Caucasus: East. Transcauc. (Apscheron Peninsula, V. Ivanova). Gen. Distr.: East, Medit. Described from Egypt. Type in Paris.

Genus 130. VENTENATA* KOELER

Koeler, Descr. Gram. (1802) 273.

Inflorescence an open panicle; branches long, bearing several spikelets at their ends. Spikelets of medium size, with club-shaped pedicels. Glumes unequal, distinctly nerved, hyaline on the margin. Lemma of the lowest floret acuminate, not bifid, awnless; that of upper florets bifid, with a geniculate awn from the back. Stamens 3. Ovary naked.

1. *V. dubia* (Leers) F. Schultz. Pollich. XX. XXI (1863) 273; Boiss. Fl. Or. V, 539. -*Avena dubia* Leers, Fl. Herborn. (1775) 41, tab. 9, fig. 3; Shmal'g. Fl. II, 616. -*Avena tenuis* Moench, Meth. (1794) 195; Griseb. in Ldb. Fl. Ross. IV, 416. -Exs.: Schulz, Herb. norm. No 770 (sub *V. triflora*); Kneucker, Gram. exs. No 30.

Annual. Culms 25-70 cm tall, slender, glabrous; leaves narrowly linear; ligule oblong. Panicle open, with slender, scaberulous branches; spikelets 2 to 5 per branch, ca. 8-9 mm long, 2-5-flowered; glumes acuminate, 7-9-nerved; lemma in lower floret tapering into an awn, in the other florets terminating in two points and furnished with a geniculate awn from the back. May-July. (Plate XVIII, Figures 26, 26a).

Dry places and slopes. -European part: Prichern., Crimea, and Low. -Don; Caucasus: Ciscauc., Dag., East. and South. Transcauc. Gen. Distr.: Centr. Eur., Medit., Balk. -As. Min., and Arm. -Kurd. Described from Germany.

Genus 131. GAUDINOPSIS** EIG.

Eig. in Fedde, Repert. spec. nov. XXVI (1929) 74.

Inflorescence a rather dense, spikelike raceme. Spikelets erect, 4-10-flowered, perfect, with short, club-shaped pedicels. Glumes somewhat unequal, the lower 3-nerved, the upper 3-5-nerved, much shorter than the florets. Lemma of the lowest floret shorter than that of the other florets, awnless, rather pointed at the summit, lemma of upper florets always awned. Stamens 3.

* Named for professor of botany P. Ventenat (1757-1805) who lived in Paris.

** From the genus *Gaudinia* (see below, p. 283) and Greek *opsis*-similar to, i.e., resembling *Gaudinia*.

1. *G. macra* (M.B.) Eig in Fedde, Repert. sp. nov. XXVI (1929) 77. - *Avena macra* M.B. Fl. taur.-cauc. I (1808) 77; Griseb. in Ldb. Fl. Ross. IV, 416; Shmal'g. Fl. II, 616. - *Ventenata macra* Boiss. Fl. Or. V (1884) 540; Grossg. Fl. Kavk. (Fl. of Cauc.) I, 87. *Gaudinia Biebersteiniana* Trin. in Mem. Acad. Petersb., ser. 6, IV suppl. (1835) 21. - Ic.: Eig. in Fedde Repert. XXVI (1929) tab. LXXIV. - Exs.: Balansa, Fl. d'or. No 757 (sub *Ventenata*); Herb. Fl. Cauc., No 154 (sub *Ventenata*).

Annual. Culms 10-30 cm tall, leafy on the lower two-thirds; leaves narrowly linear, pubescent above, rather involute; ligule 3-6 mm long. Inflorescence a spike-like raceme; spikelets 5-7-flowered longer than the joints of rachis. Glumes glabrous, usually hirsute below, 6-9 mm long; anthers ca. 3-3.5 mm long; caryopsis ca. 2 mm long. April-June. (Plate XVIII, Figure 27).

259 Dry foothills and steppes. - European part: Crimea; Caucasus: East and East. Transcauc.; Centr. Asia: Upp. Turkm. Gen. Distr.: Arm. - Kurd. Iran. Described from Crimea. Type in Leningrad.

Genus 132. AVENA* L.

L. Gen. Pl. (1737) 15.

Inflorescence a rather open panicle. Spikelets large, rather pendulous, 2-4-flowered, laterally compressed. Glumes large, rounded on the back, without a keel, 7-11-nerved, hyaline on the margin. Lemma serrate at the summit, 2-toothed or 2-awned, with a stout awn from the back, more rarely awnless. Stamens 3. Ovary hairy in upper part. Annuals. Leaves convolute in the bud.

1. Lemma with 2 awns at the summit 2.
- + Lemma with 2 teeth at the summit 8.
2. Glumes markedly unequal, the lower shorter by nearly 1/2 than the upper 3.
- + Glumes subequal or slightly unequal 4.
3. All florets of the spikelet jointed at the base, falling off readily at maturity 1. *A. clauda* Dur.
- + Only the lower floret of the spikelet jointed; all florets falling together at maturity 2. *A. pilosa* M.B.
4. Callus (pointed, hard base of lemma) 5-10 mm long 3. *A. Bruhnsiana* Grun.
- + Callus ca. 2 mm long 5.
5. All florets of the spikelet without joints, not falling off at maturity. 6.
- + All florets of the spikelet with joints, falling off readily at maturity 7.
6. Awns stout, geniculate 10. *A. strigosa* Schreb.
- + Awns straight or bent; caryopsis naked 5. *A. nuda* L.
7. Lemma prolonged at the apex into 2 slender awns (without lateral teeth); glumes 9-10-nerved 6. *A. barbata* Pott.

* The old Latin name for cultivated oats.

- + Lemma bearing at apex 1-2 lateral teeth beside the two slender awns; glumes 7-9-nerved 7. *A. Wiestii* Steud.
8. All florets of the spikelet with joints, readily shed at maturity ... 9.
- + All florets of the spikelet without joints, separable only by breaking of rachilla 12.
- 260 ++ Only the lower floret of the spikelet with a joint; all florets falling together at maturity 14.
9. Glumes to 25 mm long; lemma to 20 mm long 10.
- + Glumes to 30 mm long; lemma to 25 mm long 10. *A. meridionalis* Malz.
10. Nodes of the culm pubescent 8. *A. septentrionalis* Malz.
- + Nodes of the culm glabrous 11.
11. Caryopsis 1.5-2 mm thick; lower leaf sheaths pubescent 12. *A. fatua* L.
- + Caryopsis 2-3 mm thick; lower leaf sheaths glabrous 14. *A. cultiformis* Malz.
12. Glumes ca. 30 mm long 11. *A. macrantha* (Hack.) Malz.
- + Glumes to 25 mm long 13.
13. Nodes of the culm pubescent 9. *A. nodipilosa* Malz.
- + Nodes of the culm glabrous. Lemma lanceolate 13. *A. sativa* L.
- ++ Nodes of the culm glabrous. Lemma ovate-lanceolate 15. *A. praegravis* (Krause) Roshev.
14. Nodes of the culm pubescent 17. *A. trichophylla* C. Koch.
- + Nodes of the culm glabrous 15.
15. Spikelets very large, 30-50 mm long 18. *A. sterilis* L.
- + Spikelets to 30 mm long 16.
16. Panicle 15-30 cm long; lemma broadly lanceolate; caryopsis 2-3 mm thick 14. *A. cultiformis* Malz.
- + Panicle 40-50 cm long; lemma narrowly lanceolate; caryopsis 1.5-2 mm thick 16. *A. Ludoviciana* Dur.

1. *A. clauda* Dur. in Duchart. Rev. Bot. I (1845) 360 excl. syn.; Boiss. Fl. Or. V, 542; Mal'ts. Ovs. i ov. (1930) 230. -Ic.: Mal'ts., l.c., tab. 1, 2

- Annual. Culms 20-60 cm tall, glabrous; leaves and the lower sheaths mostly hairy; ligule ca. 3 mm long. Panicle rather 1-sided, loose, 8-20 cm long; spikelets 3-5-flowered, all awned; glumes unequal, the lower ca. 15 mm long, 3-5-nerved, the upper 25 mm long, 7-nerved; rachilla with long, dense hairs at the base of fertile florets, jointed below all the florets; lemma ca. 25 mm long, prolonged into 2 rather long awns, awned from the back, the dorsal awn geniculate, rather pubescent on its lower part (var. *eriantha* Bal.) or glabrous, scabrous (var. *leiantha* Malz.). April-May. (Plate XIX, Figures 1, a, 2).
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Exposed slopes and desert locations, more rarely roadsides. -Caucasus: East. Transcauc.; Centr. Asia: Upp. Turk., Syr-Dar., Pam. -Al. Gen. Distr.: Medit., Balk. -As. Min., Arm. -Kurd., and Iran. Described from Algeria.

2. *A. pilosa* M. B. Fl. taur. cauc. III, Suppl. (1819) 84; Shmal'g. Fl. II, 618; Mal'ts. Ovs. i Ov. (1930) 233. -Ic.: Mal'ts., l.c., tab. 3-5.

Annual. Culms 30-60 cm tall, solitary; leaves to 7 mm broad, flat; blades and sheaths pilose; ligule 2-3 mm long. Panicle open, to 20 cm long, not dense; spikelets 20-30 mm long, 2-3-flowered; rachilla jointed below the lower floret; glumes unequal, the lower nearly 1/2 shorter than the upper; lemma with two long-aristate teeth, awned from the back, awn geniculate, pubescent below (var. *pubiflora* Grun.) or glabrescent (var. *glabriflora* Grun.). April-May. (Plate XIX, Figures 3, 4).

Dry foothills. -Caucasus: Ciscauc., Dag., East. Transcauc.; Centr. Asia: Upp. Turkm., Amu-Dar. Gen. Distr.: Medit., Balk. -Asia Min., Arm. -Kurd., Iran. Described from the Caucasus. Type in Leningrad.

3. *A. Bruhnsiana* Grun. in Bull. Soc. Nat. Mosc. XL, 4 (1867) 458. -*Avena ventricosa* subsp. *Bruhnsiana* Malz. in Ovs. i Ov. (1930) 242. -Ic.: Mal'ts., l.c., tab. 9.

Annual. Culms 30-60 cm tall, glabrous; leaves usually hirsute, the lower ones twisted at the end; ligule ca. 3 mm long. Panicle 1-sided, rather loose; spikelets large, to 40 mm long, 2-flowered; rachilla with long hairs at the base of lower floret and with a joint; glumes somewhat unequal; lemma 25-30 mm long, pubescent at the summit, prolonged into two rather long awns, with a geniculate awn from the back and with a callus to 10 mm long at the base. May-June. (Plate XIX, Figure 5).

Sandy places, hillocks, more rarely coastal sands. -Caucasus: East. Transcauc. -only in Apsheron. Endemic. Type in Leningrad.

4. *A. strigosa* Schreb. Spicil. Fl. Lips. (1771) 52; Griseb. in Ldb. Fl. Ross. IV, 413; Shmal'g. Fl. II, 618; Mal'ts. Ovs. i Ov. (1930) 252 sens. strict. -Ic.: Mal'ts. l.c., tab. 19 et 23, fig. 2, 4.

Annual. Culms 60-100 cm tall, glabrous; leaves and sheaths glabrous. Panicle rather open or 1-sided, 12-18 cm long; spikelets ca. 2.5 cm long, 2-3-flowered; rachilla glabrous or with short hairs below the second floret; glumes subequal; lemma terminating in two awns, rather pilose on the back, more rarely quite glabrous (var. *glabrescens* Thell.), the stout, geniculate awn more than twice as long as the lemma. June-July. (Plate XIX, Figures 6, 7).

Among stands of oats, as a weed. -European part: Lad. -Il'm., Upp. Volg., Volg. -Kam., Upp. Dnep. Gen. Distr.: Scand., Centr. and Atl. Eur., Balk. -As. Min., and Medit. Described from Germany (Leipzig). Type in Munich.

262 5. *A. nuda* L. Diss. Dem. pl. (1753) 3 et Amoen. acad. III (1756) 401. -*Avena strigosa* var. *nuda* Hausskn. in Bot. Ver. Thur. Nat. Fr. VI (1894) 43, 45; Mal'ts. Ovs. i Ov. (1930), 266. -*Avena sativa* var. *nuda* Koern. in Koern. et Wern. Handb. d. Getreidebaues I (1885) 208, 213; Shmal'g. Fl. II, 618. -Ic.: Mal'ts., l.c., tab. 26, 27.

Annual. Culms 45-90 cm tall, with a waxy bloom and reddish nodes; leaves and sheaths glabrous. Panicle rather contracted; spikelets 3- to many-flowered, the two lower florets awned, the others awnless; glumes ca. 20 mm long, shorter than the florets; rachilla glabrous; lemma bifid at the tip, with aristate divisions, membranaceous, with prominent longitudinal nerves; awns straight or slightly bent; caryopsis loosely covered by the membranaceous lemmas from which it separates readily. (Plate XIX, Figure 8).

Spreads and runs wild in weed-infested places. -European part: Recorded by Schmalhausen for the south of the U. S. S. R.; Caucasus: recorded

by Grossheim without indication of region. Gen. Distr.: Atl. Eur. Described from cultivated specimens. Type in London.

6. *A. barbata* Pott ex Link in Schrad. Journ. Bot. II (1799) 315; Brot. Fl. Lusit. I (1804) 106; Griseb. in Ldb. Fl. Ross. IV, 412; Shmal'g. Fl. II, 618. - *Avena strigosa* subsp. *barbata* Thell. in Vierteljahresschr. d. Nat. Ges. Zürich, LVI (1911) 33; Mal'ts. Ovs. i Ov. (1930) 268. - Ic.: Mal'ts. l.c., tab. 28-31.

Annual. A green non-tufted plant or, more rarely, reddish, tufted (var. *atherantha* Presl.); culms 30-100 cm tall, smooth; leaves flat or rather involute, to 5 mm broad; blades and sheaths glabrous or rather pilose; ligule 1-2 mm long. Panicle with branches bearing numerous 2-flowered spikelets, more rarely bearing a single 3-(-4)-flowered spikelet per branch (var. *triflora* Trab.), rather open, to 25 cm long; rachilla brittle, with a joint below each floret; glumes about equal, 25-30 mm long; lemma 255 hairy on the back up to the middle, more rarely glabrous (var. *subtypica* Malz.), scaberulous toward the summit, terminating in two slender awns to 4 mm long, with a stout, geniculate dorsal awn. March-June. (Plate XIX, Figures 10, 11).

Dry foothills and as weed. -Caucasus: East. and South. Transcauc., Tal.; Centr. Asia: Kara-Kum., Upp. Turkm. Gen. Distr.: Centr. Eur., Medit., Balk. -As. Min., and Iran. Described from Portugal. Type in Leningrad.

7. *A. Wiestii* Steud. Syn. Pl. Glum. (1855) 231. - *Avena strigosa* subsp. *Wiestii* Thell. in Vierteljahresschr. d. Nat. Ges. Zürich, LVI (1911) 325; Mal'ts. Ovs. i Ov. (1930) 276. - *Avena barbata* var. *casica* Hausskn. in Bot. Ver. Thur. Nat. Fr. VI (1894) 41, 45 ex parte. - Ic.: Mal'ts., l.c. (1930) tab. 32, 33 et 35, fig. 1, 2.

Annual. Culms 40-70 cm tall, glabrous; leaves and sheaths soft-pubescent. Panicle somewhat contracted, rather 1-sided; spikelets small, ca. 15 mm long (var. *deserticola* Malz.) or of medium size, ca. 25 mm long (var. *casica* (Hausskn.) Malz.), 2-flowered, all awned; glumes somewhat unequal; all florets of the spikelet jointed, falling off readily at maturity; rachilla hairy between the florets; lemmas densely hairy, with 2 aristate teeth 3-4 mm long (var. *deserticola* Malz.) or ca. 6 mm long (var. *casica* (Hausskn.) Malz.) and 1-2 lateral teeth. April-May. (Plate XIX, Figures 12, 13).

Explanation to Plate XIX

1. *Avena clauda* Dur., spikelet; a) lemma. - 2. *A. clauda* Dur. var. *eriantha* Bal.; lemma. - 3. *A. pilosa* M.B. var. *pubiflora* Grun., spikelet without glumes. - 4. *A. pilosa* M.B. var. *glabriflora* Grun.; spikelet without glumes. - 5. *A. Bruhnsiana* Grun., spikelet without glumes. - 6, 7. *A. strigosa* Schreb. var. *glabrescens* Thell., spikelet without glumes. - 8. *A. nuda* L., spikelet. - 9. *A. barbata* Pott. var. *triflora* Trab., spikelet; a) lemma from ventral side. - 10. *A. barbata* Pott., spikelet. - 11. same, lemma from ventral side. - 12. *A. Wiestii* Steud. var. *deserticola* Malz., spikelet. - 13. *A. Wiestii* var. *casica* (Hausskn.) Malz.; spikelet. - 14. *A. septentrionalis* var. *valdepilosa* Malz., spikelet from ventral side. - 15. *A. septentrionalis* var. *glabripaleata* Malz., lemma from the back. - 16. *A. septentrionalis* var. *sparsepilosa* Malz., lemma from the back. - 17. *A. septentrionalis* var. *glabella* Malz., lemma from the back. - 18. *A. nodipilosa* var. *glabrescens* Malz., spikelet without glumes. - 19. *A. nodipilosa* var. *subglabra* Malz., spikelet without glumes. - 20. *A. meridionalis* var. *grandis* Malz., lemma from the back; a) same from ventral side. - 21. *A. meridionalis* var. *longiflora* Malz., lemma from the back; a) same from ventral side. - 22. *A. meridionalis* var. *longispiculata* Malz., lemma from the back; a) same from ventral side. - 23. *A. meridionalis* var. *elongata* Malz., lemma from the back; a) same from ventral side.



Dry stony places and mounds. -Caucasus: East. Transcauc., Tal. Gen. Distr.: east. Medit. Described from Egypt.

8. *A. septentrionalis* Malz. in Bull. f. angew. Bot. VI (1913) 915. -*A. fatua* L. subsp. *septentrionalis* Malz. Ovs. i Ov. (1930) 292. -*Inc.*: Mal'ts. Ovs. i Ov. -(1930) tab. 39-41.

Annual. Culms 60-100 cm tall, always pubescent at the nodes; leaves ciliate on the margins, rarely somewhat hairy; ligule 4-5 mm long. Panicle 15-30 cm long, open, rarely somewhat contracted; spikelets 20-25 mm long, more rarely ca. 13 mm long (var. *breviflora* Malz.), 2-3-flowered, all awned; glumes about equal. All florets with a joint, falling off readily upon ripening; lemma with 2 teeth at the summit, densely hairy on the back (var. *valdepilosa* Malz.), with scattered hairs (var. *sparsepilosa* Malz.), or glabrous (var. *glabripetala* Malz.), the geniculate awn ca. 30 mm long; callus 3-5 mm long or 1-2 mm (var. *glabella* Malz.). July-September. (Plate XIX, Figures 15, 16, 17).

Infesting crops and growing on fallow land; wild in the mountains of Centr. Asia. -European part: Kar. -Lap. -Dv. -Pech., Lad. -P'm., Volg. -Kam.; West. Siberia: Upp. Tob., Irt., Alt.; East. Siberia: Daur.; Centr. Asia: Upp. Turkm., Pam. -Al. Gen. Distr.: Scand., Iran, Mong., and N. Am. Described from specimens grown from seeds obtained from Arkhangel'sk. Type in Leningrad.

9. *A. nodipilosa* Malz. in Sorn. rast. SSSR (Weed Plants of the U.S.S.R.) I (1934) 205. -*A. fatua* subsp. *nodipilosa* Malz. Ovs. i Ov. (1930) 299. -*A. sativa* Kryl. Fl. Alt. VIII (1914) 1614. -*Inc.*: Mal'ts. Ovs. i Ov. (1930) tab. 42-49.

266 Annual. Culms 60-100 cm tall, always pubescent at the nodes; leaves and sheaths glabrous, rarely somewhat hairy. Panicle mostly open; spikelets ca. 25 mm long, 2-3-flowered; only lower florets awned, more rarely all florets awnless; glumes to 25 mm long, somewhat longer than the florets; all florets of the spikelets without a joint; rachilla glabrous; lemma ca. 20 mm long, 2-toothed at the summit, glabrous on the back, more rarely densely hairy up to the middle (var. *piligera* Malz., with hairs 3-5 mm long at the base (var. *piligera* Malz. et var. *glabriuscula* Malz.), or 1-2 mm long (var. *subglabra* Malz.), rarely entirely naked. Dorsal awn geniculate or slightly bent. June-July. (Plate XIX, Figures 18, 19).

Cultivated, and often a weed (also among stands of cereals). -Europ. part: north. Ural, no exact indication, Volg. -Kam., Zavolzh.; West. Siberia: no exact indication. Gen. Distr.: Mong. Described from above indicated places. Type in Leningrad.

10. *A. meridionalis* Malz. in Sorn. rast. SSSR (Weed Plants of USSR) I (1934) 205. -*A. fatua* subsp. *meridionalis* Malz. Ovs. i Ov. (1930) 304. -*Inc.*: Mal'ts. Ovs. i Ov. (1930) tab. 45-48.

Annual. Culms 40-100 cm tall, glabrous, more rarely nodes pubescent; leaves ciliate on the margin and at the base; sheaths rather pubescent; ligule 4-5 mm long. Panicle 30-40 cm long, somewhat 1-sided, more rarely rather open; spikelets large, 2-3-(4)-flowered. Glumes ca. 30 mm long. All florets of the spikelet with a joint; rachilla glabrous below the lower floret, hairy below the other florets; lemma 20-25 mm long, with 2 points at the summit and a geniculate awn ca. 45 mm long from the back, the back of lemma densely hairy to the middle, hairs at the base 4-5 mm long (var. *grandis* Malz.), or scattered-hairy, hairs at base 1-2 mm

long (var. *longispiculata* Malz.), or glabrous, hairs at the base 4-5 mm long (var. *longiflora* Malz.), or back of lemma glabrous and hairs at the base 1-2 mm long (var. *elongata* Malz.). June-September. (Plate XIX, Figures 20-23).

Among crops. -Caucasus: Ciscauc., East. and South. Transcauc.; Centr. Asia: Upp. Turkm., Syr-Dar., Pam.-Al. and Tyan'-Shan. Gen. Distr.; Medit., Arm.-Kurd., Iran, N. Am. Described from the Mediterranean. Type in Leningrad.

11. *A. macrantha* (Hack.) Malz. in Sorn. rast. SSSR (Weed Plants of the U.S.S.R.) I (1934) 206. -*A. fufa* subsp. *macrantha* Malz. Ovs. i Ov. (1930) 309. -*Avena sativa* var. *macrantha* Hack. in Engl. Bot. Jahrb. VI, 3 (1885) 244. -Ic.: Mal'ts., Ovs. i Ov. (1930) tab. 49-50.

Culms 60-100 cm tall, mostly with naked nodes; leaves and sheaths glabrous. Panicle somewhat one-sided, rather nodding; spikelets large, 2-3-flowered; only the lower floret awned, more rarely all florets awnless; glumes ca. 30 mm long; all florets of the spikelet without joints; rachilla glabrous; lemma 20-25 mm long, 2-toothed at the summit, densely hairy on the back to the middle (var. *pilifera* Malz.), with hairs 3-5 mm long at the base and with slightly bent, almost straight awn, more rarely awnless. June. (Plate XX, Figure 1).

267 A weed. -Caucasus: South. Transcauc. (Nakhichevan). Gen. Distr.; Balk. -As. Min., Arm.-Kurd., Iran. Described from Persia. Type in Austria.

12. *A. fatua* L. Sp. Pl. (sens. str.) (1753) 80; Mal'ts. Ovs. i Ov. 314; Griseb. in Ldb. Fl. Ross. IV, 412; Shmal'g. Fl. II, 618; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 238. -Ic.: Mal'ts., l. c., tab. 52-54.

Perennial. Culms 80-120 cm tall, glabrous; leaves ciliate at base and on the margins; sheaths of lower leaves pubescent; ligule 3-4 mm long. Panicle ca. 30 cm long, open or rather contracted; spikelets of medium size, 2-3-flowered; all florets awned; glumes 20-25 mm long; all florets of the spikelet with a joint, falling off at maturity; rachilla glabrous below the lower floret, hairy below the other florets; lemma ca. 20 mm long, 2-toothed at the summit, hairy on the back, with callus hairs 3-5 mm long (var. *pilosissima* S. P. Gray) or with callus hairs 1-2 mm long (var. *intermedia* (Lestib.) Lej. et Court.), or naked on the back with callus hairs 3-5 mm long (var. *glabrata* Peterm.), or naked on the back with callus hairs 1-2 mm long (var. *vilis* (Wallr.) Hausskn.); dorsal awn geniculate, ca. 30 mm long. June-July. (Plate XX, Figures 2-5).

As weed among crops. -European part: Lad. -Il'm., Upp. Volg., Volg. -Kam., Upp. and Mid. Dnep., Low. Don.; Zavoizh., Prichern., Crimea, Low.-Don.; Caucasus: all regions; West. Siberia: Upp. Tob., Irt., Alt. -Far East: Ze. -Bur., Ussur.; Centr. Asia: Dzung. -Tarb., Kyz. -Kum, Upp. Turkm., Syr-Dar., Tyan'-Shan. Gen. Distr.; Scand., Centr. and Atl. Eur., Medit., Mong., N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. One of the most noxious weeds in our agriculture. It takes up one and a half times as much moisture as wheat and it severely dries up the soil. In addition, it greatly reduces the quality of cereal grain which it often contaminates in considerable quantity. Spreads mostly by spontaneous seeding and predominates in spring cereals. Occasionally employed as cereal substitute.

13. *A. sativa* L. Sp. Pl. (1753) 79; Shmal'g. Fl. II, 617; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 239. - *A. fatua* subsp. *sativa* Thel. in Vierteljahrsschr. d. Nat. Ges. Zurich LVI (1911) 325 ex parte; Mal'ts. Ovs. i Ov. 333. - *Avena orientalis* Schreb. ex parte. - Ic.: Mal'ts. l. c., tab. 55-56.

Annual. Culms 60-100 cm tall, always with glabrous nodes; leaves and sheaths glabrous. Panicle open, rarely 1-sided (var. *contracta* Neillr.), to 25 cm long; spikelets of medium size, 2-3-flowered, only the lower floret awned, more rarely all florets awnless; glumes to 25 mm long, slightly longer than the floret; all florets of the spikelet without joints; rachilla glabrous; lemma lanceolate, ca. 20 mm long, 2-toothed at the summit, glabrescent, with few hairs at base, or entirely glabrous; rachilla slightly bent, or straight, or wanting. June-August. (Plate XX, Figure 6).
268 Cultivated, fairly often escaped. Grown almost everywhere with the exception of the arctic region and deserts. Described from Asia. Type in London.

ECONOMIC IMPORTANCE. A generally known food and forage plant; its grain, straw, and herbage are valuable fodder products. Oat grain is particularly valued for feeding of horses and generally also for cattle, when required to promote the strength and energy of the animals. In man's food oats are used less often compared with other cereals. The grain is usually used for groats, oatmeal and flour (for oatmeal jelly). Being a nutritious and wholesome food, oats are a most valuable product both for dietetic and general consumption. Oat straw is used for the production of coarse grades of paper.

14. *A. cultiformis* Malz. in Sorn. rast. SSSR (Weed Plants of the U.S.S.R.) I (1934) 208. - *A. fatua* subsp. *cultiformis* Malz. Ovs. i Ov. (1930) 344. - Ic.: Mal'ts., Ovs. i Ov. (1930) tab. 59, 61, 65, 66.

Annual. Culms 60-80 cm tall, with glabrous nodes; leaves and sheaths glabrous; ligule 3-4 mm. Panicle 15-30 cm long, variable in shape; spikelets plump, of medium size, 2-3-flowered; all florets awned; glumes 17-25 mm long; all florets of the spikelet or only the lower spikelet with a joint; rachilla glabrous below the lower floret, hairy below the other florets; lemma glabrous, ca. 20 mm long, 2-toothed at the summit, with a geniculate awn ca. 25 mm long from the back and hairs 4-5 mm long (var. *leiocarpa* Malz.) or 1-2 mm long (var. *pseudo-culta* Malz.) at the base. June-July. (Plate XX, Figures 7, 8).

A weed. - European part: Upp. Volg.; Volg. - Kam., Mid. Dnep. Gen. Distr.: N. Am., Centr. Eur., Medit. Described from Canada. Type in Leningrad.

15. *A. praegravis* (Krause) Roshev. comb. nova. - *A. sativa* *praegravis* Krause, Abbild. Beschr. Heft 7, tab. 1, fig. B. - *A. fatua* subsp. *praegravis* Malz. Ovs. i Ov. (1930) 325. - Ic.: Krause l. c.; Mal'ts. l. c., tab. 69, fig. 2 and 68 a.

Annual. Culms 60-100 cm tall, more rarely 150 cm (var. *arundinacea* Schur.), with glabrous nodes; leaves and sheaths glabrous. Panicle 20-25 cm long, variable in shape; spikelets of medium size, plump, 2-3-flowered; only the lower floret awned, the other florets awnless; glumes longer than the florets, to 25 mm long. All florets without joints; rachilla glabrous; lemma ovate-lanceolate, ca. 20 mm long, glabrous on the back (var. *macrotricha* Malz.), 2-toothed at the summit, with hairs

3-5 mm long at the base and a geniculate, or slightly bent, almost straight awn from the back. (Plate XX, Figure 9).

Cultivated. -European part: Lad. -Il'm., Upp. Volg. Gen. Distr.: Scand., Centr. Eur., West. Medit., N. Am. Described from Europe.

- 269 16. *A. Ludoviciana* Durieu in Act. Soc. Linn. Bord. XX (1855) 37-47. -*Avena sterilis* Auct. Plur. Fl. Ross. -*Avena sterilis* subsp. *Ludoviciana* Gillet et Magne, Fl. Franc., ed. 3 (1875) 532; Mal'ts. Ovs. i Ov. (1930) 363. -Ic.: Mal'ts., l. c., tab. 72-77. Exs.: Schulz, Herb. Norm. No 386.

Annual. Culms 50-100 cm tall, with glabrous nodes; leaves ciliate on the margins in lower part, more rarely naked, (var. *leiophylla* Malz.); sheaths, especially the lower ones, hairy. Panicle 40-50 cm long, many-flowered; spikelets 2-3-flowered, the lower ones 2-flowered, awned; glumes longer than the florets, 25-30 mm long; only the lower floret of the spikelet jointed; lemma 2-toothed at the summit, pilose on the back, with hairs 3-5 mm long at the base (var. *typica* Malz.), or spikelets 3-flowered, 30 mm long (var. *macrantha* Malz.), or lemma pilose on the back, but with hairs 1-2 mm long at the base (var. *media* Malz.), spikelets 3-flowered, 30 mm long (var. *armeniaca* Malz.), or naked on the back, with hairs 3-5 mm long at the base (var. *glabrescens* Dur.), or spikelets 3-flowered, 30 mm long (var. *turkestanica* Rgl.) or with naked back and hairs at the base 1-2 mm long (var. *glabriflora* Malz.). Awn geniculate, to 45 mm long. April-June. (Plate XX, Figures 10-14).

Foothills, also as a weed. -European part: Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: all regions except West. Transcauc.; Centr. Asia: Upp. Turkm., Amu-Dar., Syr-Dar., Pam. -Al., Tyan'-Shan. Gen. Distr. Medit., Balk. -As. Min., Arm. -Kurd., Iran. Described from France. Type in Paris.

17. *A. trichophylla* C. Koch in Linnaea XXI (1848) 393. -*A. fatua* β *trichophylla* Griseb. in Ldb. Fl. Ross. IV (1853) 412. -*A. sterilis* subsp. *trichophylla* Malz. Ovs. i Ov. (1930) 379. -*A. sterilis* f. *trichophylla* Hausskn. in Bot. Ver. Thur. Nat. Fr. VI (1894) 38, 44. -Ic.: Mal'ts., l. c., tab. 78, 79. -*O. volosistolistnyi* [hairy-leaved].

Annual. Culms 50-80 cm tall, with a pronounced waxy bloom; nodes pubescent; leaves glaucous, rather narrow, hispid; sheaths hairy. Panicle 25-30 cm long, with undivided branches bearing 1-2 spikelets each; spikelets 2-3 (-4)-flowered, the lower two awned; glumes longer than floret, 25-35 mm long; only the lower floret of the spikelet with a joint; lemma 20-30 mm long, 2-toothed at the summit, hairy on the back to the middle (var. *setigera* Malz.), more rarely glabrous (var. *subcalvescens* Malz.), with hairs ca. 5 mm long at the base. Awn geniculate, 45-60 mm long. May-July. (Plate XX, Figures 15, 16).

Dry mounds and mountain slopes. -European part: Crimea; Caucasus: East. and South. Transcauc., Tal. Gen. Distr.: Medit., Balk. -As. Min., Arm. -Kurd., Iran. Described from the Caucasus. Type in Leningrad.

18. *A. sterilis* L. Sp. Pl. ed. 2 (1752) 118. a. str.; Griseb. in Ldb. Fl. Ross. IV, 412; Boiss. Fl. Or. V, 542. -*A. macrocarpa* Moench, Meth. (1794) 196. -*A. sterilis* subsp. *macrocarpa* Briq., Prodr. Fl. Cors. I (1910) 105; Mal'ts. Ovs. i Ov. (1930) 386. -Ic.: Mal'ts., l. c., tab. 83 et 87. -*O. vespodnyi* [sterile].

270 Annual. Culms 70-100 cm tall, more or less geniculate-ascending, with glabrous nodes; leaves ciliate on the margin. Panicle ca. 30 cm long, few-flowered, with almost undivided branches bearing 1 to 2 spikelets each; spikelets very large, 3-5-flowered, the lower ones 2-, rarely 3-flowered, awned; glumes 40-50 mm long, longer than the florets; only the lower floret of the spikelet with jointed; lemma 2-toothed at the summit, densely bristly on the back to the middle, hairs at the base ca. 5 mm long, awn stout, pubescent below (var. *maxima* Perez-Lara), 50-70 mm long. July. (Plate XX, Figure 17).

Mounds, also as weed in gardens and among crops. -Caucasus: West. Transcauc. -Sukhumi, under palms (introduced?). Gen. Distr.: Medit., Centr. Eur. as introduced. Described from Mediterranean. Type in London.

Genus 133. AVENASTRUM* JESSEN.

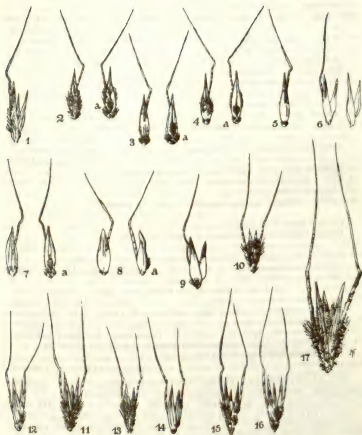
Jessen, Deutschl. Gräs, (1863) 214.

Inflorescence a rather open, more rarely spikelike, panicle. Spikelets of medium size, erect, 3-5-flowered, laterally contracted. Glumes folded, keeled, 1-3-nerved, rather hyaline. Lemma toothed at the summit, with twisted awn from the back. Stamens 3. Ovary hairy in upper part. Perennial plants. Leaves conduplicate in bud.

* From *avena*-oats and the suffix *astrum*, i.e., resembling oats.

Explanation to Plate XX

1. *Avena macrantha* (Hack) Malx., spikelet without glumes. -2. *A. fatua* L. var. *pilosissima* S.F. Gray, lemma from the back and a) from ventral side. -3. *A. fatua* L. var. *glabrata* Peterm., glume from the back, a) same from ventral side. -4. *A. fatua* L. var. *intermedia* (Lentib.) Lej. et Court., lemma from the back, a) same from ventral side. -5. *A. fatua* L. var. *vilis* (Wallr.) Hausskn., lemma from the back. -6. *A. sativa* L., spikelet with glumes removed. -7. *A. cultiformis* Malx. var. *leiocarpa* Malx., lemma from the back, a) same, from ventral side. -8. *A. cultiformis* Malx. var. *pseudoculta* Malx., lemma from the back, a) same from the side. -9. *A. praegravis* (Krause) Roshev. var. *macrotricha* Malx., spikelet with glumes removed. -10. *A. Ludoviciana* Dur., spikelet with glumes removed. -11. *A. Ludoviciana* var. *macrantha* Malx., spikelet with glumes removed. -12. *A. Ludoviciana* var. *glabrescens* Dur., spikelet with glumes removed. -13. *A. Ludoviciana* var. *media* Malx., spikelet with glumes removed. -14. *A. Ludoviciana* var. *glabriflora* Malx., spikelet with glumes removed. -15. *A. trichophylla* C. Koch, var. *setigera* Malx., spikelet with glumes removed. -17. *A. sterilis* L. var. *maxima* Perez-Lara, spikelet with glumes removed.



1. Lemma pilose on the back up to the middle 14. *A. compactum* (Boiss. et Heldr.) Roshev.
- + Lemma glabrous on the back nearly down to the base 2.
2. Spikelets large, 20-30 mm long 3.
- + Spikelets not exceeding 20 mm in length 4.
3. Leaves narrow, 2-4 mm broad, long-acuminate; spikelets 5-8-flowered 4. *A. armeniacum* (Schischk.) Roshev.
- + Leaves 6-12 mm broad, short-acuminate; spikelets 5-6-flowered 6. *A. dahuricum* (Kom.) Roshev.
4. Spikelets small, to 10 (-12) mm long 5.
- + Spikelets 10-17 mm long 7.
5. Ligule on sterile shoots to 10 mm long 8. *A. desertorum* (Less.) Podpera.
- + Ligule on most leaves ca. 0.2 mm long 6.
6. Leaves rather glabrous 11. *A. tianschanicum* Roshev.
- + Leaves with long raised hairs on the lower surface 9. *A. Krylovii* N. Pavl.
7. Rachilla with hairs 5-7 mm long, reaching to the middle of lemma 7. *A. pubescens* (Huds.) Jessen.
- + Rachilla with very short hairs or glabrescent 8.
8. Ligule very short, distinctly pubescent 11. *A. mongolicum* Roshev.
- + Ligule at least 1 mm long 9.
9. Leaves involute, blades and sheaths rather hispid 12. *A. Fedtschenkoii* (Hack.) Roshev.
- + Leaves smooth or scaberulous 10.
10. Culms almost leafless above, always scabrous 10. *A. hissaricum* Roshev.
- + Culms rather uniformly leafy, always smooth all the way up 11.
11. Rhizomes creeping 3. *A. adzharicum* (Albov) Roshev.
- + Rhizomes not creeping 12.
12. Panicle to 9 cm long; spikelets to 18 mm long, green, lustrous, turning brown; mountainous plant 5. *A. asiaticum* Roshev.
- + Panicle elongate, to 15 cm long; spikelets to 15 mm long, light green; steppe-meadow plant 2. *A. Schellianum* (Hack.) Roshev.
- ++ Panicle narrow, spikelike above, 10-15 cm long; spikelets to 20 mm long, often purplish; dry-meadow plant of the northwestern part of the Russian SFSR and of the Caucasus 1. *A. pratense* (L.) Jessen.

Series 1. *Pratenses* Roshev. - Awn rather flattened below. Leaves rather flat. Meadow plants, also ascending into the mountains.

1. *A. pratense* (L.) Jessen. Deutschl. Gras. (1863) 53, 216. - *Avena pratensis* L. Sp. Pl. (1753) 80; Griseb. in Ldb. Fl. Ross. IV, 919; Shmal'g. Fl. II, 617. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 99, fig. 1697, 1698. - Exs.: HFR No 1048 (sub *Avena*).

Perennial. Compactly tufted; culms 20-100 cm tall, glabrous, smooth; leaves linear, to 4 mm broad, scabrous, more or less folded; ligule to 5 mm long, oblong. Panicle narrow, spikelike in its upper part, 10-15 cm long; spikelets 3-5-flowered, to 2 cm long, with short, enlarged pedicels. Glumes unequal, 3-nerved; lemma 2-toothed, broadly hyaline on the margin, with awn to 2 cm long from the middle of the back; callus hairs 1-1.5 mm long, less than 1/4 the length of lemma. June-August. (Plate XXI, Figure 1, a).

Dry meadows. -European part: Lad. -Il'm., Upp. Volg. (rarely); Caucasus: Ciscauc., East and South, Transcauc. Gen. Distr.: Scand., Centr. and Atl. Eur., Medit., Arm. -Kurd. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Suitable for pastures.

2. *A. Schellianum* (Hack.) Roshev. comb. nova. -*Avena Schelliana* Hack. in Pl. Amur. A. H. P. XII (1892) 419; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 244. -*Avena pratensis* Griseb. in Ldb. Fl. Ross. IV, 414 (quoad plantam Sibiriae et Rossiae orient). -*A. pratensis* var. *Schelliana* Korsh. in Tent. Fl. Ross. Or. (1898) 471. -Lc.: Kom. and Al. Oprod. [Determin.] I (1931) tab. 55.

Perennial. Forming small tufts; culms 50-80 cm tall, glabrous, smooth; sheaths glabrous; leaves linear, to 4 mm broad, very scabrous on the margins; ligule to 4 mm long. Panicle rather contracted, up to 15 cm long, many-flowered, with short branches; spikelets 1.5 cm long, light green, 3-5-flowered; hairs on rachilla 1-1.5 mm long, 1/7-1/5 the length of floret; glumes unequal, the lower 3-nerved, the upper 3-5-nerved; lemma hyaline on the margin, awned from the back, the geniculate awn 1 1/2 times as long as the lemma. June-July. (Plate XXI, Figure 2, a).

Steppe meadows. -European part: Lad. -Il'm., Upp. Volg., Volg. -Kam., Mid. Dnep., Volg. -Don, Zavolzh., Crimea, Low Don.; West. Siberia: Upp. Tob., Irt., Alt.; East. Siberia: all regions; Far East: Ze. -Bur., Ussur.; Centr. Asia: Aral. -Casp., Pribalkh., Dzung. -Tarb., Syr-Dar., Pam. -Al., Tyan'-Shan. Gen. Distr.: Mong., Jap. -China. Described from Amur River valley. Type in Leningrad.

3. *A. adzharicum* (Albov) Roshev. comb. nova. -*Avena adzharica* Albov. in Acta Horti Bot. Tifl. I Supp. I (1895) 257.

Perennial. Culms ca. 40 cm tall, tufted; rhizomes creeping. Leaves flat, linear, obtuse, with cartilaginous margins, scabrous on the mid-vein. Panicle elongate, to 20 cm long, erect, with short branches, each bearing 1-2 spikelets; spikelets motley-colored, 4-5-flowered; glumes oblong-lanceolate, 3-nerved, unequal, the upper shorter than the florets; hairs on rachilla exceeded many-fold by the florets; lemma minutely scabrous, 2-toothed, with a geniculate awn from the middle of the back.

Alpine meadows. -Caucasus: West. Transcauc. -Adzhariya (Mount Kino). Endemic. Type in Geneva.

4. *A. armeniacum* (Schischk.) Roshev. comb. nova. -*Avena armeniaca* Schischk. in Ber. Tomsk. St. Univ. LXXXI (1929) 418.

Perennial. Rhizomes fibrous; culms 50-70 cm tall, glabrous; leaves linear, flat, 2-4 mm broad, very scabrous on the lower surface; leaf sheaths glabrous, scabrous or retrorsely short-pubescent; ligule lanceolate, naked, to 5 mm long. Panicle somewhat contracted, the lowest branch bearing 2 spikelets; spikelets 5-8-flowered, 20-30 mm long and to 12 mm broad, with very scabrous pedicels 15-20 mm long; glumes lanceolate, acuminate, 3-nerved, unequal, 18-23 mm long; rachilla with short hairs on the ribs, the hairs below the spikelet 1.5-2.5 mm long. Lemma 17-19 mm long, erose at the summit, scabrous, awn geniculate, twisted below, attached at the middle and twice as long as the lemma; palea ciliate on the margins. July-August. (Plate XXI, Figure 3).

Mountain meadows. -Caucasus: South. Transcauc. Gen. Distr.: Arm. -Kurd. Described from Turkish Armenia. Type in Leningrad.

5. *A. asiaticum* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 770. — *Avena versicolor* auct. fl. asiat.

Perennial. Forming small, rather compact tufts; culms 20–60 cm tall, glabrous, smooth; leaves narrowly linear, to 4 mm broad, glabrous, with scabrous margins; ligule pointed, 4–5 mm long. Panicle rather contracted, to 9 cm long, with short branches; spikelets to 18 mm long, mostly 5-flowered, more or less golden-green, turning brown; rachilla glabrous below, with hairs ca. 1 mm long above; glumes unequal, the lower 8–10 mm, the upper 12–13 mm long, obscurely nerved; lemma with hyaline margins, faintly 2-toothed, awn geniculate, ca. 1.5 cm long, attached above the middle. June–August. (Plate XXI, Figure 4).

Alpine and subalpine meadows. — Caucasus: all regions; West. Siberia: Alt.; Centr. Asia: Dzung. — Tarb., Syr-Dar., Pam. — Al., Tyan'-Shan. Endemic. Described from the mountains of Central Asia. Type in Leningrad.

6. *A. dahuricum* (Kom.) Roshev. comb. nova. — *Avena dahurica* Kom. Fl. Kamch. I (1927) 159. — *Avena planiculmis* Turcz. Fl. baic. — dahur. III (1856) 322 non Schrad.

Perennial. Forming small tufts; rhizome short-creeping; culms 50–80 cm tall, thick, rather flattened at the base; leaves broad, 6–12 mm, flat, short-acuminate; ligule ca. 5 mm long. Panicle narrow, few-flowered, to 25 cm long; spikelets 5–6-flowered, 20–25 mm long, pale green, more rarely dark-colored, brunescent (var. *kamtschaticum* Kom.), with a white fringe; glumes unequal, 1–3 nerved; lemma 2-toothed, awn attached about the middle and nearly twice as long as the lemma; hairs at the base of florets, ca. 1–1.5 mm long. July–September. (Plate XXI, Figure 56).

Dry slopes and waterless valleys. — East. Siberia: Len. — Kol., Ang. — Sayan., Daur.; Far East: all regions (though infrequently). Described from Dauria, Shilka River. Type in Leningrad.

7. *A. pubescens* (Huds.) Jessen, Deutsch. Gras. 53, I (1863) 16. — *Avena pubescens* Huds. Fl. Angl., ed. 1 (1762) 42. — Griseb. in Ldb. Fl. Ross. IV, 413; Shmal'g. Fl. II, 616; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 242. — *Avena glabra* C. Koch. in Linn. XIX (1846) 5. — Ic.: Rchb. Ic. Fl. Germ. I, tab. 100, fig. 1700. — Exs.: Kneuck. Gram. exs. No 33.

276 Perennial. Tufted; rhizome creeping; culms 30–120 cm tall, stout, smooth; leaves and sheaths short-villous, more rarely glabrous (var. *alpina* Gaud.); leaves 4–6 mm broad, rarely 8–10 mm (f. *latifolia* Roshev.); ligule 3–5 mm long. Panicle rather open, ca. 15 cm long; spikelets pale green or with a purple stripe, 12–17 mm long, 2–3 (–4)-flowered; rachilla with hairs 5–7 mm long, reaching the middle of lemma; glumes unequal, the lower shorter, 1-nerved, more rarely 3-nerved (var. *amethystina* (Clar.) Litw.), the upper 3-nerved; lemma 2-toothed at the summit, the geniculate awn attached about the middle, 1 1/2 times as long as the lemma. May–July. (Plate XXI, Figure 7, a).

Meadows, forest borders, and coppices. — European part: Kar. — Lap., Lad. — Il'm., Upp. Volg., Volg. — Kam., Upp. Dnep., Mid. Dnep., Volg. — Don., Zavolzh., Prichern.; Caucasus: all regions except Tal.; West. Siberia: Upp. Tob., Irt., Alt.; East. Siberia: Ang. — Sayan., Daur.; Centr. Asia: Pribalkh., Dzung. — Tarb., Syr-Dar., Tyan'-Shan. Gen Distr.: Scand., Centr. and Atl. Eur., Medit., Balk. — As. Min. Described from England. Type in London.

NOTE. The fodder value of this grass depends wholly on the fertility and moisture supply of soil. On irrigated meadows and flood plains it gives fairly good hay yields; under such conditions it is a tall plant, well worth cutting; in dry places, on the other hand, it becomes tough, strongly pubescent, furnishes poor fodder, and is only suitable for grazing.

Series 2. *Deserticolae* Roshev. - In this series the awn is subterete below. Leaves long, narrow, setaceous-involute. Steppe plants, penetrating also into mountain steppes.

8. *A. desertorum* (Less.) Podpera sp. Laus. Schulfl. d. Sudetenland. (1908) 49. - *Avena desertorum* Less. in *Linnaea* ix (1834) 208; Griseb. in Ldb. Fl. Ross. IV, 415; Kryl. Fl. Zap. Sib., II, 240. - *Avena sempervirens* Bess. Enum. Pl. Volh. (1822) 6 non Vill. - *Avena Besseri* Griseb. in Ldb. Fl. Ross. IV (1853) 415; Shmal'g. Fl. II, 617. - 279 Exs.: HFR No 1398; Fl. exs. Austro-Hung. No 3977.

Perennial. Forming compact tufts; culms 30-60 cm tall, slender, rather scaberrulous below the inflorescence; leaves setaceous-involute, long, glabrous or puberulent; ligule to 10 mm long. Panicle 4-10 cm long, rather open; spikelets greenish or variegated, to 14 mm long, 3-flowered; rachilla with hairs reaching to the middle of lemma; glumes acutely lanceolate, unequal, the lower 1-nerved, the upper 3-nerved. Lemma awned from the back, awn geniculate, 1 1/2-2 times as long as the lemma. May-July. (Plate XXI, Figure 8).

Steppes, also ascending into the mountains. - European part: Volg. - Kam., Mid. Dnep., Volg. - Don., Zavolzh.; West. Siberia: Upp. Tob., Alt.; East. Siberia: Ang. - Sayan., Daur.; Centr. Asia: Aral. - Casp., Pribalkh., Dzung. - Tarb., Syr-Dar., Pam. - Al., Tyan'-Shan. Gen. Distr.: Centr. Eur., Dzung. - Kashg., Mong. Described from southern Ural. Type in Leningrad.

9. *A. Krylovii* N. Pavl. in *Animadv. syst. Herb. Univ. Tomsk.* No 5-6 (1933) 1. - *Avena Krylovii* N. Pavl. l. c.

Perennial. Tufts compact; culms 20-40 cm tall, glabrous, smooth, with numerous remains of dead leaf sheaths at the base; leaves 1-2 mm broad, setaceous-involute, those of the innovations attaining 1/5-1/4 the length of the culm, culm-leaves, 2 in number, 15-13 cm long. Leaf sheaths furrowed, densely clothed with long, spreading hairs, glabrescent in upper part. Ligule to 0.2 mm long, pubescent on the margin. Panicle 4-6 cm long, rather loose, oblong, with branches 0.5-1.5 cm long, sparsely hairy or glabrescent; spikelets 9-11 mm long, 2-3-flowered, motley greenish-purple. Rachilla hairy, florets 3-4 times as long as the hairs below them. Glumes broadly lanceolate, unequal, the lower 1-nerved, the upper 3-nerved. Lemma broadly lanceolate, 2-toothed at the summit, awned from the middle; awn geniculate, twisted below, 1 1/2-2 times as long as the floret; palea membranaceous, somewhat shorter than the lemma, with 2 cilliate keels. Anthers blackish-purple. May-August.

Steppe slopes, - East. Siberia: Len. - Kol. Endemic. Described from Yakutiya. Type in Moscow, cotype in Tomsk.

10. *A. hissaricum* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 770.

Perennial. Forming compact tufts; culms 60-70 cm tall, glabrous, slightly scabrous, surrounded at the base by numerous sheaths of old leaves; leaves narrowly linear, 1.5-3.5 mm broad, involute, attaining 1/2 the height of the culm; blades and sheaths glabrous, scabrous; ligule ca. 1 mm long.



rather lacerate. Panicle 7-9 cm long, contracted, oblong, with short, pubescent branches; spikelets ca. 12(-15) mm long, 2-3-flowered, yellowish-brown after anthesis; rachilla hairy, the hairs 1/8-1/5 as long as the lemmas; glumes broadly lanceolate, 3-5-nerved, the lower 11 mm long, the upper 13 mm long; lemma broadly lanceolate, serrate at the summit, geniculate awn from the middle of the back, twice as long as the body of lemma. September. (Plate XXI, Figure 9.).

Steppe-mountain slopes. -Centr. Asia: Pam. -Al., Endemic. Described from Gissar Range, northern slope (26 September 1928, No 2110. N. Goncharov). Type in Leningrad.

Series 3. Tianschanicae Roshev. -Awn terete below. Leaves short, setaceous-involute, forming dense clusters at the base of culms. High-mountain areas of Tyan'-Shan, Altai, and Sayan.

11. *A. tianschanicum* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 771.

Perennial. Forming compact tufts; culms 14-30 (-50) cm tall, slender, smooth, glabrous, surrounded at the base by numerous sheaths of old leaves; leaves narrowly linear, 1.5-3 mm broad, usually short, attaining 1/8-1/2 the height of the culm involute, rather glabrous, with pubescent sheaths; ligule very short, ca. 0.2 mm in length, short-pubescent. Panicle few-flowered, 4-8 cm long, oblong, with short branches; spikelets 9-10 mm long, 2-3 (4)-flowered, more or less variegated; rachilla hairy, the hairs 1/4-1/3 as long as the lemmas; glumes broadly lanceolate, unequal, the lower 3-nerved, the upper 5-nerved; lemma serrulate at the summit, broadly lanceolate, awned from the back, the geniculate awn 1 1/2-2 times as long as the body. June-August. (Plate XXI, Figure 10).

Alpine meadows. -Centr. Asia: Tyan'-Shan, Endemic. Described from the mountains near Karakol. Type in Leningrad.

12. *A. Fedtschenkoi* (Hack.) Roshev. comb. nova. -*Avena Fedtschenkoi* Hack. in A. H. P. XXVI (1906) 55. -O. Fedchenko.

Perennial. Tufted; culms 40-60 cm tall, glabrous, scaberulous below the inflorescence; leaves 2-3 mm broad, involute; sheaths and leaves rather hispid; ligule blunt, ca. 1 mm long. Panicle oblong, ca. 8 cm long, rather dense, with branches to 3 mm long; spikelets 3-flowered, ca. 12 mm long, rather dark purple; rachilla pubescent, with hairs to 3 mm long below the florets; glumes about equal, 11-12 mm long, about as long as the spikelet; lemma ca. 10 mm long, 4-toothed at the summit, the awn attached at the middle and attaining 15 mm in length. August. (Plate XXI, Figure 11).

High-mountain regions. -Centr. Asia: Pam. -Al. Endemic. Described from Shugnan, from Rostu-dag Region. Type in Leningrad.

13. *A. mongolicum* Roshev. comb. nova. -*Avena mongolica* Roshev. in Bull. Jard. Bot. Princip. XXVII (1928) 96.

Explanation to Plate XXI

1. *Avenastrum pratense* (L.) Jessen., inflorescence, a) spikelet. -2. *A. Schellianum* (Hack.) Roshev., inflorescence, a) spikelet. -3. *A. armeniacum* (Schischk.) Roshev., spikelet. -4. *A. asiaticum* Roshev., spikelet. -5, 6. *A. dahuricum* (Kom.) Roshev., spikelet and leaf tip. -7. *A. pubescens* (Huds.) Jessen., spikelet, a) leaf tip. -8. *A. desertorum* (Less.) Podpera, spikelet. -9. *A. hispanicum* Roshev., spikelet. -10. *A. tianschanicum* Roshev., spikelet. -11. *A. Fedtschenkoi* (Hack.) Roshev., spikelet. -12. *A. compactum* (Boiss. et Heldr.) Roshev., spikelet. -13. *A. mongolica* Roshev., spikelet.

Perennial. Tufted; culms 12-50 cm tall, smooth, sometimes purplish; leaves narrowly linear, to 2.5 mm broad; ligule obsolete, pubescent. Panicle loose, 3-6 cm long; spikelets 3-flowered, to 12 mm long, brownish or more
 281 or less purplish; rachilla hairy, the hairs $1/4-1/3$ as long as the lemmas; glumes lanceolate, the lower 1-nerved, the upper 3-nerved; lemma deeply 2-toothed, the awn attached at the middle of the back and nearly twice as long as the lemma. July-August. (Plate XXI, Figure 13).

Mountain slopes. -West. Siberia: Alt; East. Siberia: Ang. -Sayan., Daur.; Centr. Asia: Dzung. -Tarb. Gen. Distr.: Mong. Described from northern Mongolia. Type in Leningrad.

Series 4. *Compactae* Roshev. -Awn flat, 3-nerved. Lemma hairy on the back to the middle. Mountains of Caucasus and of the Balk. -Asia Min. region.

14. *A. compactum* (Boiss. et Heldr.) Roshev. comb. nova -*Avena compacta* Boiss. et Heldr. Diagn. ser. 1, VII (1846) 122. -*Danthonia compacta* Boiss. et Heldr. ex Boiss. Fl. Or. V (1884) 548.

Perennial. Forming compact tufts; culms 10-30 cm tall, slender, glabrous, smooth, surrounded at the base by numerous sheaths of old leaves; leaves setaceous-involute, stiff, smooth, rarely exceeding half the length of the culm; ligule to 1 mm long. Panicle spike-like, 3-6 cm long, with 2-7 spikelets; spikelets 1.5-2 (-2.5) cm long, 5-7-flowered, whitish-yellow; glumes somewhat unequal, long-acuminate; rachilla with hairs 2-3 mm long; lemma with 2 aristate teeth at summit, hairy on the back to the middle, the geniculate awn attached near the middle and nearly twice as long as the lemma. July-August. (Plate XXI, Figure 12).

Mountains, on rocks. -Caucasus: West. Transcauc. (Bzybskii Range, Aibga rocks, 1,800 m). Gen. Distr.: Balk. -As. Min. Described from Greece. Type in Geneva.

Genus 134. *ARRHENATHERUM** P.B.

P.B. Agron. (1812) 55.

Inflorescence paniculate. Spikelets laterally compressed, 2-flowered, the lower floret staminate, the upper perfect. Glumes membranaceous, unequal. Lower lemma with a long geniculate awn, the upper awnless or with a short, straight awn. Stamens 3. Stigmas plumose.

- 1. Spikelets 7-9 mm long; lemma glabrous 1. *A. elatius* (L.) M. et K.
- + Spikelets 16-17 mm long; lemma with long, silky hairs 2. *A. Kotschyi* Boiss.

1. *A. elatius* (L.) M. et K. Deutsch. Fl. I (1823) 546; Griseb. in 282 Ldb. Fl. Ross. IV, 410; Boiss. Fl. Or. V, 550; Shmal'g. Fl. II, 619; Kryl. Fl. Zap. Sib. II, 248. -*Avena elatior* L. Sp. Pl. (1753) 79. -*Arrhenatherum avenaceum* P.B. Agron. (1812) 152, tab. 11, fig. 5. -*lc.*: Rchb. *lc.* Fl. Germ. I, tab. 104, fig. 1715-1717. -*Exs.*: HFR No 93; Fl. exs. Austro-Hung., No 1093.

* From Greek *arren*, masculine, and *ather*, awn, referring to the invariably awned staminate floret.

Perennial. Forming small tufts; culms 60-120 cm tall, smooth; leaves flat, 3-7 mm broad, very scabrous on the margin; ligule 2 mm long, obtuse. Panicle contracted, to 25 cm long, with short branches; spikelets 7-9 mm long, occasionally more or less purplish; glumes unequal, the lower 1-nerved, the upper 3-nerved; lemmas with 7-9-nerved, 2-toothed at the summit, the lower lemma with geniculate awn, that of the upper floret awnless, rarely awned (var. *biaristata* Peterm.). June-July.

Meadows. -European part: Kar. -Lap., Lad. -D'm., Upp. Volg., Volg. -Kam., Upp. Dnep., Mid. Dnep., Volg. -Don., Zavolzh., Prichern., Crimea, Low. Don.; Caucasus: Ciscauc., West., East., and South. Transcauc.; Centr. Asia: Upp. Turkm. Gen. Distr.: Scand., Centr. and Atl. Eur., Medit., and Balk. -As. Min., Arm.-Kurd., and Iran. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Belongs among the best grasses, being nutritious, tender, early, and high-yielding. Gives two to four cuts per year. It is, however, always sown in mixture with other grasses, as it is not readily eaten by livestock in pure state, on account of the bitter taste of its herbage. Not exacting as regards soil, cold-resistant.

2. A. Kotschy Boiss. Diagn. ser. 1, VII (1846) 122. -Exs.: Kotschy, Pl. Pers. austr. (1845), No 272.

Perennial. Growing in loose tufts; culms rather erect, 30-60 cm tall, with one or two shortened, tuberously enlarged internodes, glabrous, smooth; leaves linear, flat, 2-4 mm broad, scaberulous; ligule to 3 mm long. Panicle contracted, somewhat 1-sided, to 20 cm long, many-flowered; spikelets 16-17 mm long, with bent pedicels, pale green or slightly purplish; glumes unequal, the lower shorter, 1-nerved, the upper longer, 3-nerved, both aristate-pointed; lemma with 5-6 nerves, 2-toothed or 2-awned at the summit; lemma of staminate floret with long hairs below and on the margin, awn 4.5 cm long, stout, geniculate, twisted below, attached close to the base; lemma of the perfect floret with long hairs all over the back, awn straight, ca. 2 cm long, attached at the middle. June.

Mountain slopes. -Caucasus: South. Transcauc. (Sarai-bulag Crest, near the nomad camp of Dym-igl. A rocky-stony slope, 10 June, 1931. I Karyagin and B. Safiev). Gen. Distr.: Arm.-Kurd., Iran. Described from southern Persia. Type in Geneva, cotype in Leningrad.

Inflorescence a 2-rowed compound spike, with a prominently scabrous rachis readily breaking up in fruit into separate joints. Spikelets laterally compressed, 4-7-flowered, perfect, the upper florets of the spikelet abortive. Glumes unequal, the lower 3-5-nerved, the upper nearly twice as long, 7-9-nerved. Lemma lanceolate, hyaline on the margin, with a long, geniculate awn from the back. Palea hyaline, 2-toothed at the summit, with 2 keels. Stamens 3. Stigmas plumose. Caryopsis not furrowed.

* Named for J. Gaudin (1766-1833), who lived in Switzerland and studied its flora.

1. *G. fragilis* (L.) P.B. Agrost. (1812) 164; Griseb. in Ldb. Fl. Ross. IV, 411; Boiss. Fl. Or. V, 549; Shmal'g. Fl. II, 619; Grossg. Fl. Kavk. II (1928) 90. -*Avena fragilis* L. Sp. Pl. (1753) 80. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 13, fig. 1367. -Exs.: Bourgeau Pl. d'Espagne et Port., No 2054.

Annual. Culm 20-60 cm tall, erect, branching at the base; leaves narrowly linear, hairy; ligule very short. Inflorescence to 20 cm long; spikelets ca. 1 cm long, green; glumes pubescent on the nerves, unequal; lemma ca. 7 mm long, with awn as long. May-June.

Sandy places. -European part: Crimea; Caucasus; recorded for Tiflis (Koch) and for Ganzhinskii Raion. Gen. Distr.: Mediterranean. Described from Crimea. Type in Leningrad.

Genus 139. DANTHONIA* DC.

DC. Fl. Fr. III (1805) 32.

Inflorescence a contracted panicle, with short branches. Spikelets 2- to many-flowered, laterally compressed, perfect. Glumes somewhat swollen, as long as the floret or somewhat longer. Lemma keelless, 2-toothed at the summit, with awn attached between the teeth; awn flat at the base, usually twisted and geniculate. Palea with 2 keels. Stamens 3. Stigmas plumose. Caryopsis naked.

1. A whitish-green plant, finely velutinous. Panicle many-flowered, covered by the sheath of the uppermost leaf. Occurs in the Soviet Union only in Central Asia. 1. *D. Forskahlei* (Vahl) Trin.
- + A green, glabrous plant 2.
3. Leaves glabrous. Occurs in the Soviet Union only in the Caucasus 2. *D. calycina* (Vill.) Rchb.
- + Leaves hairy. Occurs in the Soviet Union only in the Far East 3. *D. intermedia* Vasey.

- 284 1. *D. Forskahlei* (Vahl.) Trin. Gram. Ic. et descr. I (1828) tab. 49; Boiss. Fl. Or. V, 551. -*Avena Forskahlei* Vahl., Symb. II (1791) 25. -Ic.: Trin., l.c., tab. 49. -Exs.: HFR No 1446.

Perennial. Tufted; roots long, with a coating of grit adhering to the root hairs; culms 3-30 cm tall, rather ascending, hairy at the nodes; leaves narrowly lanceolate, puberulent. Panicle oblong-linear, many-flowered, covered by the sheath of the uppermost leaf; spikelets whitish-green, ca. 1 cm long, 2-3-flowered; glumes short-velutinous; lemma with numerous nerves, the nerves covered with long hairs. May-June.

Sands. -Centr. Asia: Kara-Kum., Amu-Dar. Gen. Distr.: East. Medit. and Iran. Described from Egypt. Type in Copenhagen.

2. *D. calycina* (Vill.) Rchb. Ic. Fl. Germ. I, (1834) 44, tab. 103, fig. 1713, 1714. -Grossg. Fl. Kavk. I, 90. -*Avena calycina* Vill. Pl. Dauph. II (1787) 148. -Ic.: Rchb., l.c. -Exs.: Kneucker, Gram. exs., No 336.

* Named for the botanist F. Danthoine, who lived at the beginning of the 19th century in Marseilles and studied the grasses of Provence.

Perennial. Culms 30-60 cm tall, slender, smooth; leaves 1-2 mm broad, flat or rather involute; ligule consisting of a ciliate fringe. Panicle few-flowered, ca. 5 cm long; spikelets ca. 1.5 cm long, 2-5-flowered, green or rather purplish; glumes long-acuminate, much longer than the florets. Lemma ca. 7 mm long, with awn 1 1/2-2 times as long. June-July.

Dry, sunny and grassy places. -Caucasus: South, Transcauc. (Loriiskaya Steppe). Gen. Distr.: Centr. Eur. and West. Medit. Described from south-eastern France, from Dauphine. Type in France, in Grenoble.

3. *D. intermedia* Vasey in Bull. Torrey Bot. Club X (1883) 52; Hulten Fl. Kamtch. I (1927) 119. -*Avena* Riabuschinskii Kom. in Fedde Repert. Spec. nov. XIII (1914) 85; Komarov, Fl. poluostr. Kamchat. (Fl. of Kamchatka Peninsula) I (1927) 160. -*lc.*: Hulten, l.c., fig. 10 (lemma with awn).

Perennial. Tufted; culms 20-40 cm tall, slender, smooth; leaves narrowly linear, hairy; ligule consisting of a ciliate fringe. Panicle ca. 4 cm long, few-flowered; spikelets 1.5-2 cm long, 4-flowered, green or rather purplish; glumes long-acuminate, 10-13 mm long, 3-nerved; lemma with long hairs at the base and on the margin, awn flat, to 7 mm long. July-August.

Meadows on dry river terraces with sandy soil. -Far East: Kamch. Gen. Distr.: North Amer. Described from North Amer. Type in Washington.

TRIBE X. CHLORIDEAE KUNTH.

Kunth in Mem. Mus. Paris. II (1815) 73.

Spikelets 1-2 to many-flowered, sessile, arranged in 2 approximate, not opposite rows, on one side of the rachis, forming 1-sided spikes or racemes with a short, continuous rachis.

- 285 1. Inflorescence consisting of spikelike branches, in digitate arrangement at the end of the culm 2.
 + Inflorescence a compound or simple spike 4.
 2. Lemma long-awned 138. *Chloris* Sw.
 + Lemma always awnless 3
 3. Perennial plant, with a long, creeping rhizome
 137. *Cynodon* Rich.
 + Annual plant; roots fibrous 141. *Eleusine* Gaertn.
 4. Spikelets linear-lanceolate, 3-5-flowered; leaves narrow, rather setaceous-involute 139. *Tripsogon* Roth.
 + Spikelets round, somewhat 1-2-flowered; leaves linear, flat, to 7 mm broad 140. *Beckmannia* Host.

Genus 137. CYNODON* RICH.

Rich. in Penn. Syn. I (1805) 85.

Inflorescence digitate, consisting of branches grouped at the summit of the culm, with spikelets in spikelike arrangement on the branches in

* From Greek *kineos*-canine, and *odon*-tooth.

two approximate rows Spikelets small, 1-2-flowered, perfect, sessile. Glumes 2, membranaceous, keeled, shorter than the florets. Lemma hyaline, 3-nerved. Palea as long as the lemma, 2-keeled. Stamens 3. Stigmas plumose, reddish.

1. *C. dactylon* (L.) Pers. Syn. I (1805) 85; Griseb. in Ldb. Fl. Ross. IV, 452; Shmal'g. Fl. II, 620. - *Panicum Dactylon* L. Sp. Pl. (1753) 58. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 36, fig. 1404. - Exs.: HFR No 947.

Perennial. Rhizomes long, branching; culms 10-50 cm tall, ascending, branching at the base; leaves linear-lanceolate, stiff, to 5-7 cm long, more rarely soft, 10-15 cm long (var. *septentrionale* Asch. et Gr.), glabrous (f. *glabrum* Roshev.), or hairy (f. *villosum* Rgl.), rather glaucous; ligule short, ciliate. Inflorescence consisting of 3-8 spikelike branches; spikelets sessile, ovoid; glumes, lemma and palea lanceolate, hispid on the keel. June-August. (Plate XXII, Figure 1, a).

Sandy places, roadsides, and as a weed. - European part: Mid. Dnep., Prichern., Crimea, Low. Don., Low. Volg.; Caucasus: all regions; West. Siberia: Upp. Tob., Irt.; Centr. Asia: all regions. Gen. Distr.: Centr. Eur., Medit., Balk. - As. Min., Arm. - Kurd., Iran, Ind. - Him., Dzung. - Kashg., Mong. Described from southern Europe. Type in London.

ECONOMIC IMPORTANCE. A noxious weed in stands of cotton and un-irrigated rice, often very difficult to control; but it plays an important role in pasturage, being readily grazed by livestock, especially by sheep. Nutritious, stands up to trampling, puts up well with saline soils, and not
286 infrequently covers almost uniformly considerable areas. Under the name Bermuda grass, it occupies in the southern part of the United States of America a position as pasture grass comparable with that of Kentucky bluegrass in the north. It is used in considerable amount for hay cutting. Yields ca. 2.25 tons per hectare. According to American authors, it equals timothy in value.

Genus 138. CHLORIS* SWARTZ

Swartz, Fl. Ind. Occ. I (1797) 189.

Inflorescence consists of spikelike branches digitately arranged at the top of the culm. Spikelets 1- to many-flowered, arranged in 2 approximate rows. Glumes 2, coriaceous, keeled, obtuse or awned. Lemma more or less triangular, keeled, often awned. Palea about as long as the lemma, with 2 keels. Stamens 3. Stigmas plumose.

1. Inflorescence consisting of 1 to 3 spikelike branches. Lemma with long hairs on the keel and on lateral nerves down to the base

. 1. *Ch. villosa* Pers.

+ Inflorescence consisting of 4-10 spikelike branches. Lemma glabrous, with long silvery hairs only on the upper part of lateral nerves

. 2. *Ch. virgata* Sw.

1. *Ch. villosa* (Desf.) Pers. Syn. I (1805) 87. - *Tetrapogon villosus* Desf. Fl. Atl. II (1800) 87. - Ic.: Desf. Fl. Atl. II (1800), tab. 255.

* From Greek *chloros* - yellowish-green.

Perennial. Tufted; culms 30-60 cm tall, erect, glabrous, almost leafless in upper part; leaves linear, narrow, glabrous, rather flat; ligule short, ciliate. Inflorescence contracted, consisting of 1-3 spike-like branches; spikelets 4-flowered, the two lower florets perfect, the upper two reduced; glumes hyaline, glabrous, short-awned; lemma ovate, obtuse, with 3 nerves clothed with long hairs, the long awn attached below the summit. May-June. (Plate XXII, Figure 3, a).

Mountain slopes. -Centr. Asia: Upp. Turkm. Gen. Distr.: Medit., Iran. Described from North Africa.

2. *Ch. virgata* Swartz, Fl. Ind. Occid. I (1797) 203. -*Ch. caudata* Trin. in Bge. En. Pl. Chin. (1831) 70. -*Ch. Alberti* Rgl. in A.H.P. VII (1880) 650.

Perennial. Culms 12-60 cm tall, rather ascending, glabrous, smooth, leafy almost up to the summit; leaves linear-lanceolate, glabrous, scabrous, flat; sheaths of upper leaves rather inflated. Inflorescence dense, consisting of 4-10 spike-like branches, to 5 cm long; spikelets 2-flowered; glumes hyaline, glabrous, the lower acuminate, the upper short-awned; lemma ovate, obtuse, 3-nerved, glabrous, with long silvery hairs on upper part of lateral nerves, the long, straight awn attached below the summit. July-August. (Plate XXII, Figure 2, a).

287 Dry steppes, sometimes as a weed. -Caucasus: Dag. (Gunibskii Raion); Centr. Asia: Pribalkh., Dzung. -Tarb.; Far East: Ussur. frontier. Gen. Distr.: tropical and subtropical countries. Described from India. Type in London.

Genus 139. *TRIPOGON** ROTH

Roth ex Roem. et Schult. Syst. II (1817) 34 et 600.

Inflorescence terminal, spike-like. Spikelets numerous, the lower ones perfect, the upper staminate or abortive. Lemma terminating in three awns, of which the middle is an extension of the midnerve and the lateral ones of the lateral nerves.

1. *T. chinensis* (Franch.) Hack. in Bull. Herb. Boiss., ser. 2, V (1903) 503. -*Nardurus filiformis* var. *chinensis* Franch. Pl. David. I (1884), 339.

Perennial. Forming compact tufts; culms 15-20 cm tall, slender, glabrous, smooth. Leaves narrowly linear, setaceous-involute. Ligule short, ciliate. Inflorescence consisting of a 1-sided spike, with 2 approximate rows of spikelets. Spikelets linear-lanceolate, 3-5-flowered. Glumes unequal, lanceolate. Lemma lanceolate, terminating in a short, straight awn and 2 lateral teeth, hairs to 1 mm long at the base. August. (Plate XXII, Figure 4, a, b).

Stony slopes. -East. Siberia: Daur. (Nerchinsko-zavodskii region, Kancha Village and the basin of Argun' River, surroundings of Sektuevskii settlement). Far East: Ussur. (rarely). Gen. Distr.: Mong., Jap. -Chin. Described from North China and Korea. Type in Vienna.

* From the Greek words *treis*-three, and *pogon*-beard.

Genus 140. BECKMANNIA* HOST.

Host, Gram. Austr. III (1805) 5, tab. 6.

1. Culms more or less tuberously thickened at base; spikelets 2-flowered, round, rather strongly inflated; lemma short-mucromate at the summit or without a mucro 1. *B. eruciformis* (L.) Host.
- 288 + Culm always without tuberous enlargement at the base; spikelets 1-flowered or merely with a rudiment of second floret, faintly inflated; lemma produced into a sharp mucro' 2. *B. syzigachne* (Steud.) Fernald.

1. *B. eruciformis* (L.) Host, Gram. Austr. III (1805) 5; Griseb. in Ldb. Fl. Ross. IV, 453; Shmal'g. Fl. II, 620; Kryl. Fl. Zap. Sib. II, 248. - *Phalaris erucaeformis* L. Sp. Pl. (1753) 55. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 25, fig. 1402, 1403. - Exs.: HFR No 548.

Perennial. Rhizomes creeping; culms 50-150 cm tall, erect, more or less tuberously thickened at base; leaves linear, flat, 3-7 mm broad, rather scabrous on the margin; ligule to 6 mm long. Inflorescence to 30 cm long, 1-sided, often more or less branching below (f. *ramosa* Pacz.); spikelets round, light green, more rarely purplish (f. *colorata* Roshev.), 2.5-3 mm long, 2-flowered, forming small imbricated spikes; glumes shorter than the florets, more or less inflated. Lemma lanceolate, rather pubescent on the back, June-August. (Plate XXII, Figure 5, a-c).

Wet meadows and river banks. - European part: all regions except Kar. - Lap. and Dv. - Pech.; Caucasus: Ciscauc., East. and South. Transcauc., Tal.; West. Siberia: Upp. Tob. and Irt. (?); Centr. Asia: Aral-Casp., Pribalkh., Kyz. - Kum. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk. - As. Min., Arm. - Kurd. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Approaching foxtail and timothy in fodder quality. Produces satisfactory yields of hay and good aftergrowth, but should be cut before the emergence of inflorescences, as it soon becomes coarse. Stands up well to salinity.

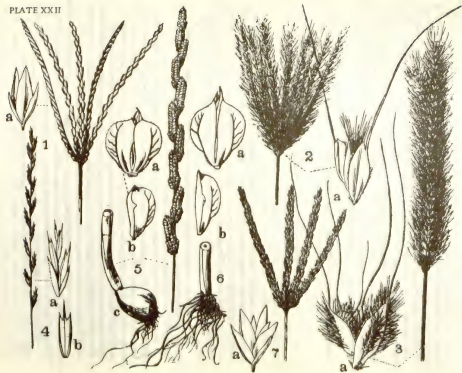
2. *B. syzigachne* (Steud.) Fernald in Contrib. Gray Herb. LXXIX (1928) 27. - *Panicum syzigachne* Steud. in Flora XXIX (1846) 19. - *B. erucaeformis* var. *syzigachne* Steud. Syn. Pl. Gram. (1855) 15. - *B. erucaeformis* var. *uniflora* Scribn. in Vasey, Deser. Cat. Grasses U.S. (1885) 8 (nomen). - *B. eruciformis* f. *uniflora* Krylov in Kryl. Fl. Alt. (1914) 1622. - *B. erucaeformis* var. *baicalensis* W. Kuznetsov in Tr. po Prikl. Bot. (Bull. Appl. Bot.) VI (1913) 584; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 249. - *B. baicalensis* Hulten Fl. Kamtch. I (1927) 119.

* Named for J. Beckmann (1739-1811), a naturalist in Petersburg, author of a botanical dictionary.

Explanation to Plate XXII

1. *Cynodon dactylon* (L.) Pers., inflorescence, a) spikelet. - 2. *Chloris virgata* Sw., inflorescence, a) spikelet. - 3. *Ch. villosa* (Desf.) Pers., inflorescence, a) spikelet. - 4. *Tripsogon chinensis* (Franch.) Hack., inflorescence, a) spikelet, b) lemma. - 5. *Beckmannia eruciformis* (L.) Host., inflorescence, a) spikelet, b) glumes, c) tuberous enlargement of culm base. - 6. *B. syzigachne* (Steud.) Fernald., culm base, a) spikelet, b) glumes. - 7. *Eleusine indica* (L.) Gaertn., inflorescence, a) spikelet.

PLATE XXII



Perennial. Forming loose tufts; culms 30-120 cm tall, erect, smooth, 2-4 mm thick; leaves broadly linear, flat; ligule to 7 mm long. Inflorescence largely unbranched or with secondary and tertiary branches, to 30 cm
291 long; spikelets rounded-cuneate, green or more or less purplish, 1-flowered, occasionally with an abortive second floret, 2.5-3 mm long, forming small imbricate spikes; glumes shorter than the flowering bracts, faintly inflated, glabrous or more or less hirsute (var. *hirsutiflora* Roshev.); lemma narrowly lanceolate, glabrous on the back. June-September. (Plate XXII, Figure 6, a, b).

Flood plains and marshy meadows. -European part: Volg. -Kam. (?); West. Siberia: Upp. Tob., Irt., Alt.; East. Siberia: all regions; Far East: all regions; Centr. Asia: Pribalkh., Tyan'-Shan. Gen. Distr.: Mong., Jap. - Chin., North Amer. Described from Japan.

NOTE. Found in excavations from the post-Pliocene, in mammoth's food. Len. -Kolym. (Berezovka, Yakutiya).

Genus 141. ELEUSINE* GAERTN.

Gaertn. De Fruct. I (1788) 8.

Inflorescence digitate, comprising branches collected at the top of the culm; spikelets in spicate arrangement on the branches, in 2 approximate rows. Spikelets 2-many-flowered, perfect, sessile. Glumes 2, keeled, about as long as the flowering bracts. Lemma scaphoid, 3-nerved, keeled, awnless. Palea with 2 keels. Stamens 3. Stigmas filiform. Caryopsis free, round.

1. *E. indica* (L.) Gaertn. De Fruct. I (1788) 8; Griseb. in Ldb. Fl. Ross. IV 453. -*Cynosurus indicus* L. Sp. Pl. (1753) 106. -Exs.: Blansa, Pl. d'Orient (1866) no 1548.

Annual. Plant branching at the base; culms 20-50 cm long, ascending, glabrous, smooth, flattened; leaves narrowly linear, 2-4 mm broad, glabrous or sparsely hairy, scabrous on the upper surface; ligule short, with long hairs. Inflorescence consisting of 3 to 6 branches, to 10 cm long, arranged in a cluster; spikelets laterally compressed, 2-6-flowered, in spikelike arrangement in 2 approximate rows; glumes somewhat shorter than the flowering bracts, with a scabrous keel; lemma thinly coriaceous, scaberulous on the keel. June-September. (Plate XXII, Figure 7, a).

Roadsides and weed-infested places. -Caucasus: West. and East. Transcauc. Gen. Distr.: Medit., Balk. -As. Min., Arm. -Kurd., Iran. Ind. -Him., Jap. -Chin. Described from India. Type in London.

ECONOMIC IMPORTANCE. Seeds edible. Used for weaving of baskets, hats, etc. Apparently suitable for paper manufacture.

* Name from the Greek town Eleusis.

TRIBE XI. FESTUCEAE NEES

Nees, *Agrost. bras.* (1829) 466.

Spikelets 2-many-flowered, rarely 1-flowered, mostly fertile, arranged in a panicle or raceme (in the case of very short pedicels almost spike-like). Glumes usually shorter than the flowering glumes. Lemma awnless or with 292 a single awn, more rarely with numerous awns; awns straight or slightly bent, but not geniculate. Awn or awns attached at the tip of lemma, rarely somewhat below it. Palea with 2 keels. Starch grains compound.

Analytical Key to Genera

1. Lemmas terminating at the tip in three or numerous lobes or points which are often produced into awns. Inflorescence spike-like or capitate 2.
- + Lemmas 2-toothed or 2-lobed at the tip, awnless or awned 3.
2. Lemmas with 9 to 12 nerves, excurrent at the tip in long awns 142. *Pappophorum* Schreb.
- + Lemmas terminating in 5 recurved, spiny lobes, the central lobes being longer than the lateral ones 143. *Echinaria* Desf.
- ++ Lemmas 3-5-toothed at the tip, the teeth prolonged into short awns 145. *Sesleria* Scop.
- +++ Lemmas obtuse and serrate at the tip, with 5-9 awns attached at the middle of the back 190. *Boissiera* Hochst.
3. Rachilla or lemmas with long hairs 4.
- + Rachilla and lemmas glabrous or short-pubescent 6.
4. Dioecious plant; lemmas of staminate spikelets glabrescent or faintly hairy, those of pistillate spikelets clothed with long hairs. South American plant occurring in this country only in the Caucasus, as ornamental or escaped 146. *Cortaderia* Stapf.
- + Monoecious plants; spikelets covered with long hairs 5.
5. Lemmas with long hairs; rachilla glabrous 147. *Arundo* L.
- + Lemmas glabrous; rachilla, with the exception of its lowest joints, clothed with long hairs 148. *Phragmites* Trin.
6. Annual plant, 1-3 cm tall, with a slightly spike-like, capitate inflorescence 144. *Ammochloa* Boiss.
- + Larger plant, or if small-not with a capitate inflorescence 7.
7. Spikelets of two kinds: fertile spikelets of normal structure, surrounded by sterile ones consisting of long-awned bracts pectinately arranged in 2 rows 164. *Cynosurus* L.
- + All spikelets alike 8.
8. Lemmas 3-toothed at the tip. Rachilla brittle, with hairs under the lemmas 149. *Siglingia* Bernh.
- + Lemmas different 9.
- 293 9. Lemmas 1-2-nerved; spikelets with perfect florets or with only the terminal floret staminate or sterile 10.
- + Lemma with 3 or more nerves 18.
10. Branches of panicle in spiral arrangement 11.

- + Primary branches of panicle arranged in 2 rows 11.
- 11. Culm with only 1 or 2 approximate nodes at the base, otherwise without nodes; inflorescence a narrow, long, contracted, rarely loose, panicle 151. *Molinia* Schrank.
- + Culm with nodes up to its middle or even beyond 12.
- 12. Spikelets 5-30-flowered, linear-oblong, with bracts closely imbricate in 2 rows; if florets few then spikelets very small 152. *Eragrostis* Host.
- + Spikelets 2-5-flowered, with loosely overlapping bracts 150. *Diplachne* P.B.
- 13. Perennials 14.
- + Annuals 16.
- 14. Panicle spike-like, or very dense, contracted; glumes longer than the lemma 153. *Koeleria* Pers.
- + Inflorescence an open, more rarely contracted, panicle with smooth branches; glumes much shorter than the spikelet, sometimes lacking 15.
- 15. Dwarf arctic plants, 2-20 cm tall; spikelets 1-flowered, rarely 1-flowered 174. *Phippsia* R.Br.
- + Plants not arctic, to 60 cm tall; spikelets always 2-3-flowered, ... 173. *Catabrosa* P.B.
- 16. Inflorescence a rather compact panicle, sometimes slightly lobed below 154. *Lophochloa* Rchb.
- + Inflorescence a loose panicle 17.
- 17. Panicle open, with slender, long branches and small spikelets. 155. *Sphenopus* Trin.
- + Panicle with very short, divergent, thick branches; spikelets rather large 156. *Cutandia* Willk.
- 18. (9) terminal florets of the spikelet reduced forming a club-shaped or roller-shaped appendage 157. *Melica* L.
- + Club-shaped appendage of abortive florets absent. 19.
- 19. At least 2 upper florets of the spikelet reduced; lemmas coriaceous; caryopsis with a conical beak protruding beyond the lemmas. Only in the Far East 158. *Diarrhena* P.R.
- + All the florets of the spikelet, or only the terminal one staminate or neuter 20.
- 20. Palea with two keels, each bearing 2, more rarely 3, aristate appendages 159. *Pleuropogon* R.Br.
- + Palea without aristate appendages on the keels 21.
- 294 21. Spikelets 1-flowered, containing 2 sterile lemmas (Shaped like reduced fertile lemmas); lemmas long-awned 160. *Brylkinia* Fr. Schm.
- + Spikelets 2-many-flowered, without sterile lemmas 22.
- 22. Lemmas cordate at the base and somewhat inflated, bladderlike. 161. *Briza* L.
- + Lemmas not cordate and not inflated 23.
- 23. Spikelets arranged in short spikes which form a raceme or head 162. *Aeluropus* Trin.
- + Spikelets arranged in a panicle or a loose spike-like inflorescence. 24.
- 24. Spikelets 3-5-flowered, crowded in clusters at the ends of branches, forming a more or less lobed panicle 163. *Dactylis* L.

- + Spikelets not crowded in clusters 25.
- 25. Inflorescence branches arranged in false whorls, 12 or more together; so far not found in the U.S.S.R. *Nephelochloa* Boiss.
- + Inflorescence branches in aggregates of 2-5 26.
- 26. Glumes longer than the florets; if as long as the florets then inflorescence paniculate 27.
- + Glumes shorter than the spikelet; if longer than the spikelet or as long then inflorescence a spike 28.
- 27. Lemmas bidentate or bilobed at the summit 166. *Schismus* P.B.
- + Lemmas entire or serrulate 170. *Dupontia* R. Br.
- 28. Lateral nerves of lemmas almost parallel, not connivent with midnerve; lemmas always awnless, obtuse 29.
- + Lateral nerves of lemmas arcuately connivent with midnerve at the summit; lemmas always acuminate or awned 33.
- 29. Glumes nearly as long as the adjoining lemmas 30.
- + Glumes much shorter than the adjoining lemmas 31.
- 30. Lemmas with 2 tufts of hairs, ca. 1 mm long, at the base, acuminate 175. *Scolochloa* Link.
- + Lemmas without a tuft of hairs at the base, subobtuse, serrate, or crenate at the summit 172. *Colpodium* Trin.
- 31. Lemma with a small bulge at the base, furnished with a tuft of straight, stiff hairs 171. *Arctophila* Rupr.
- + Lemmas without hairs at the base 32.
- 32. Leaf sheaths entire throughout; spikelets to 2 cm long; lemmas with 7 distinct nerves 176. *Glyceria* R. Br.
- 295 + Leaf sheaths split nearly down to the base; spikelets to 8 mm long; lemmas with 5 obscure nerves 177. *Atropis* Rupr.
- 33. Spikelets on short, stout pedicels; lemmas cartilaginous at the base, herbaceous above 165. *Sclerochloa* P.B.
- + Spikelets on short pedicels; lemmas herbaceous or hyaline throughout their length 34.
- 34. Lemmas 7-nerved, with tufts of hairs at base, glabrous elsewhere, with 2 teeth at summit and awned from below the teeth 183. *Schizachne* Hack.
- + Lemmas usually with 5, more rarely with 7-9 nerves, without tufts of hairs at base, entire or slightly short-bidentate, more rarely with 2 teeth 35.
- 35. Lemmas folded and laterally compressed, thus forming a dorsal keel reaching down to the base 36.
- + Lemmas involute, not compressed laterally, thus back of lemma rounded or occasionally forming a rather distinct keel only in its upper part 38.
- 36. Spikelets not exceeding 12 mm in length; lemmas entire, nearly always without awn or aristate point 37.
- + Spikelets 15-30 mm long; lemmas more or less bidentate at the summit, awnless or with an aristate point 189. *Ceratochloa* P. B.
- 37. Lemmas always without awn or aristate point 167. *Poa* L.
- + Lemmas with a point or a very short awn, not exceeding 1 mm 168. *Bellardiachloa* Chiov.
- 38. Inflorescence a raceme, i.e., the spikelets arranged along the rachis at some distance from each other, on short pedicels not exceeding

- 0.5 mm in length. 181. *Nardurus* Rchb.
- + Inflorescence a rather open or contracted panicle, always with distinct, fairly long branches at least in the lower part of the inflorescence. 39.
- ++ Inflorescence a spike, with spikelets placed edgewise to the rachis. 45.
39. Panicle 1-sided, rigid, with divaricate, thickened, short branches; pedicels trigonous 182. *Scleropoa* Griseb.
- + Panicle with different characters 40.
40. Ovary naked; stigmas attached at the top of the ovary; lemmas entire at the summit, obtuse or acute, awnless or prolonged into an awn. 41.
- 296 + Ovary hairy at the top, the stigmas, 2 in number, set on its front side, markedly below the top; lemmas membranaceous at the summit mostly bidentate or emarginate, nearly always with a long awn invariably attached somewhat below the summit; spikelets usually large . . . 44.
41. Annuals 42.
- + Perennials 43.
42. Panicle with long branches arranged in half-whorls; glumes somewhat unequal; lemmas narrowly lanceolate, acuminate or short-awned 169. *Eremopoa* Roshev.
- + Panicle slender, contracted, racemose; glumes markedly unequal; lemmas lanceolate-subulate, gradually attenuate into an awn, the awn exceeding its lemma 180. *Vulpia* Gmel.
43. Glumes whitish-membranaceous, keeled, the lower lanceolate, sub-acute, the upper larger, ovate or rather obtusish, or with a lacerate apex 178. *Leucopoa* Griseb.
- + Glumes not hyaline, more or less green, keeled, lanceolate, unequal, the lower 1-nerved, the upper 3-nerved 179. *Festuca* L.
44. Spikelets with loosely set bracts; lemmas elliptical-lanceolate, bluntly pointed or erose at the summit, 7-13-nerved, always awnless; lodicules large, pointed, hairy at the top. 187. *Littledalea* Hemsl.
- + Spikelets with imbricate bracts; lemmas 5-9-nerved, mostly bidentate at the summit, usually with a rather long awn; lodicules small, elongate, naked 188. *Bromus* L.
45. (38). Glumes always two. 188. *Lolium* V. Krecz. et Bobr.
- + All spikelets with a single glume (except the uppermost spikelet in *Lolium*) 46.
46. Spikelets many-flowered, arranged in fairly stout spikes 186. *Lolium* L.
- + Spikelets 2-flowered, with a rudimentary upper floret; spikes slender; stamen solitary 186. *Psilurus* Trin.

Genus 142. PAPPOPHORUM* SCHREB.

Schreb. in L. Gen. Pl., ed. 8, 1 (1789) 787.

Inflorescence a spikelike panicle. Spikelets 2-3-flowered; the lower florets perfect, the upper staminate or abortive. Glumes longer than the 297 lemmas, with numerous nerves. Lemmas 9-12 nerved, prolonged at

* From Greek pappos=pappus, and phoros=bearing.

the summit into long awns. Palea with 2 keels. Stames 3. Stigmas plumose. Caryopsis ovoid-ellipsoid.

1. Annual. Spikelets ca. 4 mm long, glaucous-gray; glumes glabrous. 1. *P. boreale* Griseb.
- + Perennial. Spikelets ca. 8 mm long, pinkish or silvery-white, turning stramineous or brownish; glumes velutinous 2. *P. persicum* (Boiss.) Steud.

1. *P. boreale* Griseb. in Ldb. Fl. Ross. IV (1853) 404. - *Pappophorum phleoides* Turcz. in Bull. Soc. Nat. Mosc. XXIX (1856) 30. - *Czernavia rupestris* Turcz. in herb. - *Raspailia rupestris* Turcz. in herb. - *Agrostis ciliata* Pall. in herb.

Annual. Tufted; culms 5-25 cm tall, slender, more or less pubescent; leaves narrowly linear, setaceous-folded, soft, blades and sheaths more or less pubescent; ligule very short, ciliate. Inflorescence spike-like, oblong, 1-4 cm long; spikelets containing one perfect and one abortive floret; glumes narrowly lanceolate, the lower 3-nerved, the upper 5-nerved; lemmas ciliate on the nerves, with 9-12 straight, ciliate awns from the summit, the awns twice as long as the lemma. July-September. (Plate XXIII, Figure 2).

Stony places. - East. Siberia: Ang. - Sayan., Daur.; Centr. Asia: Tyan'-Shan. Gen. Distr.: Dzung. - Kashg., Mong. Described from Zabaik. Type in Leningrad.

2. *P. persicum* (Boiss.) Steud. Syn. Pl. Gram. (1855) 200. - *Eneapogon persicum* Boiss. Diagn. ser. 1 V (1844) 71. - *Pappophorum turcomanicum* Trautv. in A. H. P. I (1871) 27. - *P. Aucheri* Jaub. et Spach, III Pl. Or. IV (1850-53) 32. - Ic.: Jaub. et Spach., l. c., tab. 323; Rozhev. in Fl. Turkm. II, 117, fig. 53. - Exs.: Sintenis It. Transc.-persic. 1900-1901, No 478.

Perennial. Forming large tufts; culms 15-35 cm tall, slender, pubescent at the nodes and below them; leaves narrowly linear, involute; ligule very short, ciliate. Inflorescence spike-like, 3-8 cm long; spikelets 2-3-flowered, ca. 1 cm long; glumes velutinous, with numerous nerves, the upper longer than the lower; lemma much shorter than the glumes, ovate-rounded, 9-nerved, prolonged at the summit into plumose awns, the awns 3-4 times as long as their lemma. May-July. (Plate XXIII, Figure 1).

Dry, mostly stony slopes. - Centr. Asia: Kara-Kum., Upp. Turkm., Syr-Dar., Pam. - Al. Gen. Distr.: Iran. Described from Persia. Type in Geneva.

Desf. Fl. Atlant. II (1798-1800) 385. (Nomen conservandum). - *Panicastrella* Moench, Meth. (1794) 205.

Inflorescence a spherical head. Spikelets 2-3(-4)-flowered, cuneate, laterally compressed. Glumes dissimilar, hyaline, the lower with 2-3

* From Greek *echinos* - hedgehog.

** Compiled by V. L. Nekrasova.

short awns, the upper with 1 awn. Lemmas much longer than the glumes, coriaceous, the lower terminating in 5 recurved, spiny lobes, the upper in 2 points. Lodicules cuneate, lobed. Stamens 3; stigmas 2, filiform, serrate, long; caryopsis oblong-ovoid.

1. *E. capitata* (L.) Desf. Fl. Atlant. II (1798-1800) 385. -Griseb. in Ldb. Fl. Ross. IV, 405; Shmal'g. Fl. II 621. -*Cenchrus capitatus* L. Sp. Pl. (1753) 1049. -*Panicastrella capitata* Moench. Meth. (1794) 206. -*Sesleria echinata* Lam. Illustr. I (1791) 198. -Lc.: P. B. Agrost. (1812) Pl. XVII, fig. 11; Hackel in Engl. und Prnt. Pflnzf. (1887) II. Th., 2 Abt., fig. 75; Rozhevits in Fl. Turkm. II, 119, fig. 54.

Annual. Culms 5-25 cm tall, often bushy-branching at the base; leaves flat, linear, stiff; spikelets 2-3-flowered, the upper ones usually sterile; glumes hyaline, ovate, of equal size, emarginate, with a sharp mucro in the notch; lemmas convex, with 5 unequal reflexed teeth; pales with 2 teeth. April-July. (Plate XXIII, Figure 3).

Dry, stony slopes. -European part: Crimea; Caucasus; East., West., and South. Transcauc.; Centr. Asia: Upp. Turkm., Syr-Dar. Gen. Distr.: West. and East. Medit. Described from the Mediterranean. Type in London.

Genus 144. AMMOCHLOA* BOISS.

Boiss. Diagn. ser. I, XIII (1853) 51.

Inflorescence capitate, consisting of few spikelets clustered on a short-ened culm among sheaths of radical leaves. Spikelets laterally compressed, many-flowered, the florets perfect. Glumes shorter than the florets, winged on the keel. Lemmas 5-nerved, with a membranaceous margin, tapering to a small prickle. Palea somewhat shorter than the lemma, with 2 finely ciliate keels. Lodicule lacking. Stamens 3. Stigmas long, puberulent. Caryopsis oblong, naked.

1. *A. palaestina* Boiss. Diagn. ser. I, XIII (1853) 52. -*Sesleria subacaulis* Bal. in Sched. Pl. Alg. Exsic. No 709 (1853). -*Ammochloa subacaulis* Boiss. Fl. Or. V (1884) 566. -*Dactylis palaestina* Steud. Syn. Pl. Glum. I (1855) 428. -Exs.: Bal. Pl. d'Or. (1855) No 747.

299 Annual. Forming small tufts; culm very short or obsolete, so that the entire plant is 1-3 cm tall; leaves numerous; consisting of a dilated, hyaline-margined sheath and a narrow (2-3 mm wide), folded, scabrous blade; ligule 1-1.5 mm long, serrate. Inflorescence capitate, enclosed within the vaginate leaves, bearing 2-5 spikelets; spikelets 8-14-flowered, 10-12 mm long and to 8 mm broad; glumes ovate, obtuse or terminating in a prickle; lemmas coriaceous, broadly hyaline on the margin, stiffly scabrous, the apical prickle arising from between the hyaline lobes. March-April. (Plate XXIII, Figure 4, a).

Sands. -Caucasus: recorded for East. Transcauc. (Amperonsk Peninsula). Gen. Distr.: South. and East. Medit. Described from Palestine. Type in Geneva.

* From Greek *ammos*-sand, and *chloa*-grass.

Genus 145. SESLERIA* SCOP **

Scop, Fl. Car. ed. I (1760) 63

Panicle dense, spike-like, ovoid or oblong, with very short branches, furnished at the base of the lower branches with hyaline, more or less serrate, small leaves. Spikelets subsessile, laterally compressed, usually 2-flowered. Glumes subequal, keeled, scabrous on the keel, thinly membranaceous; lemmas with numerous nerves above, 3-5-toothed, the teeth prolonged into short awns; lodicules 2, with 2-5 incisions at the top. Stamens 3. Pistils short; stigmas long, filiform, finely plumose, exerted beyond the tip of spikelet. Caryopsis free, flattened on the inside. Perennials with closed sheaths and leaves conduplicate in the bud.

1. Glumes narrowly lanceolate, to 0.9 (1) cm long; spikelet arranged in a spike-like, cylindrical, elongate panicle, 3-8 cm long; lemmas glabrous (Series 2. Autumnales Nevski) 4. *S. autumnalis* (Scop.) F. Schultz.
- + Glumes ovate or ovate-lanceolate, 0.4-0.6 cm long; spikelets 0.4-0.6 cm long, arranged in an ovoid of ovoid-lanceolate panicle, 1-2.4 cm long; lemmas usually short-pilose (Series 1. Coeruleae Nevski) 2.
2. The central awn nearly as long as its lemma, and in any case exceeding half its length, to 2.5-2.75 mm long. Panicle ovoid, very dense and compact 3. *S. phleoides* Stev.
- + The central awn not exceeding half the length of its lemma, 0.5-1.75 (2) mm long. Panicle ellipsoid-ovoid or oblong 3.
- 300 3. The central awn 0.5-1 mm long, much less than half the length of its lemma; leaves faintly scabrous on the margin in upper part 1. *S. coerulea* (L.) Ard.
- + The central awn (1) 1.5-1.75 (2) mm long, half as long as its lemma; leaves very scabrous on the margin 2. *S. Heuffleriana* Schur.

Series 1. Coeruleae Nevski (characters in the key).

1. *S. coerulea* (L.) Ard., Animadv. Bot. Spec. II (1763-64) 18; Griseb. in Ldb. Fl. Ross. IV, 405 pro parte; Shmal'g. Fl. II, 621. -*Cynosurus coeruleus* L. Sp. Pl. (1753) 72. Ic.: Fl. Dan. tab. 1506. -Exs.: HFR No 43.

Perennial. Tufted; rhizomes creeping, fairly thin; culms 10-40 (5) cm tall, glabrous and smooth; leaves narrowly linear, 1.5-3 mm broad, folded, smooth, only in upper part scabrous on the margin, rounded-obtuse at the apex, abruptly attenuate to a short mucro. Panicle ellipsoid-ovoid or oblong-ovoid, very dense, spike-like, 1-2 cm long and 0.6-1 cm broad, more or less glaucous-purple-tinged; spikelets 0.5-0.6 cm long, short-pedicel; glumes ovate, 0.3-0.35 cm long, with awns to 1 mm long; lemmas 4 mm long, finely pilose, 5-7-nerved, with 3-5 short aristate points at the summit, the longer middle awn-point being 0.5-1 mm long, much less than half the length of lemma, the lateral points quite short. May-June. (Plate XXIII, Figure 5, a, b).

* Named for the physician and naturalist Leonard Sessler, who lived in Venice in the 18th century.

** Compiled by S. A. Nevskii.

Damp meadows on lime soil. -European part: Lad. -Il'm. Gen. Distr.: Scand., Atl. and Centr. Eur., West. Medit., Balk. -As. Min. Described from Europe. Type in London.

2. *S. Heuffleriana* Schur., in Verh. Siebend. Ver. VII (1856) 203; Shmal'g. Fl. II, 622. -*S. transsilvanica* Schur l.c., 205.

Perennial. Rhizome short-creeping, relatively thick; culms 10-50 cm tall, smooth or scabrous below the inflorescence, wrapped at the base in old, brownish-gray sheaths; leaves narrowly linear, 2-3 mm broad, prominently scabrous on the edge, obtusely pointed. Panicle oblong, ovoid, 1-2.4 cm long and 0.5-0.9 cm broad, very dense, spikelike, rather intensely glaucous-purple-tinged; spikelets 4-5 mm long; glumes ovate, 2.5-3 mm long, somewhat shorter than the spikelet, produced at the summit into awns to 1.5 mm long; lemmas finely pilose, 3 (3.5) mm long, with 3-5 short awns, the middle awn (1) 1.5-1.75 (2) mm long, half as long as the lemma, the lateral ones shorter. May.

Exposed stony slopes with calcareous soil. -European part: Mid. Dnep.; Caucasus: Ciscauc. Gen. Distr.: Balk. -As. Min. (Western part of the region). Described from Transylvania.

301 3. *S. phleoides* Stev. ex Roem. et Schult. Syst. Veg. II (1817) 604; M.B. Fl. Taur. -Cauc. III (1819) 64; Griseb. in Ldb. Fl. Ross. IV, 406. -*S. nitida* C.A.M. Verz. Pfl. Cauc. (1831) 21. -*S. caucasica* Scheele in Flora XXVII (1844) 55. -*S. polyathera* C. Koch in Linnaea XXI (1848) 399; Griseb. l.c.

Perennial. Tufts compact; rhizome short-creeping; culms 10-25 (50) cm tall, glabrous and smooth, enveloped at the base in old brownish-gray sheaths; leaves narrowly linear, folded, smooth on the lower surface, sometimes puberulent on the upper surface, scabrous on the margin in upper part, produced at the apex into a small mucro; leaves of the culm short. Panicle ovoid, very dense and compact, recalling the panicle of *Phleum alpinum* L., 1-1.8 (2) cm long and 0.9-1.1 cm broad, rather intensely purple-tinged; spikelets 0.5-0.6 cm long, on very short pedicels; glumes ovate or ovate-lanceolate, ca. 0.4 cm long, with short awn 0.1-0.15 cm in length; lemma finely pilose (more rarely glabrous-f. *glabrescens* Hack.), 3-3.5 mm long, with 5 awns at the summit, the middle awn to 2.5-2.75 mm long, nearly as long as the lemma and, in any case, more than half as long, lateral awns shorter than half the length of the lemma. May-July. (Plate XXIII, Figure 6, a, b). Gritty slopes of the high-mountain zone, rocks. -Caucasus: Dag., East. and South. Transcauc., Tal. Gen. Distr.: Arm. -Kurd., Balk. -As. Min. Described from eastern Transcaucasia. Type in Leningrad.

Series 2. Autumnales Nevski (characters in the key).

4. *S. autumnalis* (Scop.) F. Schultz, Arch. Fl. (1855) 318. -*Phleum autumnale* Scop. Fl. carniol., ed. II, 1 (1772) 56. -*Festuca argentea* Savi ap. Uster. Annal. (1800) tab. 1, fig. 1. -*Sealeria argentea* Savi, Bot. Etrusc. I (1808) 66. -*S. elongata* Host, Gram. Austr. II (1802) 69, tab. 97; Griseb. in Ldb. Fl. Ross. IV 406. -Exs.: Fl. exs. Austr. -Hung., No 288.

Perennial. Rhizome creeping; culms loosely tufted, glabrous and smooth or scabrous below the panicles, 25-55 cm tall, enveloped below in old gray or brownish-gray sheaths; leaves long, folded, bluish-green, glabrous, rigid, prominently scabrous on the margin due to sharp prickles, produced at the apex into a scabrous point; leaves 0.3-0.65 cm broad and up to

30-35 cm long. Inflorescence a spikelike, dense, narrow panicle with very short branches, light whitish-stramineous, more rarely purple-shaded; panicle 3-8 cm long and 0.6-0.8 (1) cm broad; spikelets 0.6-0.9 (1) cm long; glumes narrowly lanceolate, to 0.9 (1) cm long, as long as the spikelet or nearly so, tapering gradually into awns, scabrous on the keel in upper part; lemmas lanceolate, glabrous or with scarce hairs at the base only, the mid-nerve produced into a scabrous awn 0.15 cm long and 4 teeth at the sides of longer, with 2 keels prolonged at the summit into short points; stamens 4 mm long. (June) July-September. (Plate XXIII, Figure 7, a, b).

Rocks. -European part: Crimea; Caucasus: Ciscauc., West. Transcauc. Gen. Distr.: Balk.-As. Min., West. Medit. Described from Italy.

Genus 146. CORTADERIA* STAPF.

Stapf in Gard. Chron. XXII (1897) 396.

Inflorescence a large, dense panicle. Dioecious, spikelets with weakly expressed sexual dimorphism, 3-6-flowered; upper florets more or less reduced. Staminate spikelets with narrow, sublinear, long acuminate glumes and a lanceolate, 3-nerved, sparsely pilose or glabrous lemmas. Pistillate florets resemble the staminate, but are copiously hairy on the lemma. Stamens 3. Large, reedlike plants forming dense tussocks.

1. *C. dioica* (Spreng.) Speg. in Annal. Mus. Nac. Buen. Ayres. VII (1902) 194. -*Arundo dioica* Spreng. Syst. I (1825) 361. -*Arundo Selloana* Schult. Mant. III (1827) 605. -*Cortaderia Selloana* Asch. et Gr. Syn. II (1900) 325. -*Gynerium argenteum* Nees, Agrost. Bras. (1829) 462. -*Cortaderia argentea* Stapf in Gard. Chron. ser. 3, XXII (1897) 396.

Perennial. Tufts large, dense; culms stout, erect, 2-3(-6) m tall, glabrous, scaberulous, leafless in upper part, leaves narrowly linear, to 3 m long and to 1 cm broad, prominently scabrous on the margin; ligule to 3 mm long, consisting of dense silky hairs. Panicle 30-50 (-100) cm long, oblong, dense, rather silvery, in plants with staminate spikelets denser and longer than in plants with pistillate spikelets; spikelets 5-7-flowered, narrow, lanceolate, 12-13 mm long; glumes thin, subhyaline, narrow, long-acuminate, somewhat unequal; lemmas narrowly lanceolate, long-acuminate, in staminate spikelets almost glabrous or faintly hairy, in pistillate spikelets with long hairs; palea shorter than the lemma. August-September. (Plate XXIII, Figure 10, a, b).

In this country only as an ornamental plant, or escaped as a weed. -Caucasus: West. Transcauc. Gen. Distr.: South. Brazil and Argentina; grown as a cultivated plant in nearly the whole of Europe and North America. Described from South America.

ECONOMIC IMPORTANCE. A beautiful ornamental plant. Leaves of this plant are used in South America for paper production.

* Name from the Argentine plant name Cortadera

Genus 147. ARUNDO* L.**

L. Gen. ed. 5 (1754) 35.

Panicle very large with numerous spikelets. Spikelets of medium size, 303 2-7-flowered, laterally compressed. Florets perfect. Glumes subequal and about as long as the lemmas. Lemmas covered with long, silky hairs. Rachilla glabrous. Caryopsis fusiform, free. Very large perennial plants.

1. *A. donax* L. Sp. Pl. (1753) 81; Griseb. in Ldb. Fl. Ross. IV, 394. -*Donax donax* Asch. Fl. Nordost. Flachl. (1898) 101. -Ic.: Rehb. Ic. Fl. Germ. I 109, fig. 1731. -Exs.: HFR No 1097.

Perennial. A grayish-green plant; rhizome thick, long; culms erect, usually 2-4 m tall, to 4 cm thick; leaves with smooth sheaths and 3-6 cm broad, smooth (or scaberulous only on the margin), long-acuminate blades; ligule very short. Panicle dense, large, (20) 40-70 cm long, much branched; main axis and branches very scabrous; spikelets 8-12 mm long, golden or light brownish; glumes lanceolate, acute, lustrous; lemmas covered with soft hairs of nearly their own length, bidentate at the summit, awned from between the teeth, the awn 1-2 mm long. September-December. (Plate XXIII, Figure 8).

Borders of streams, lakes, and ditches. -Caucasus: West. and East. Transcauc., Tal.; Centr. Asia: Upp. Turkm. (along Sumbar River), Amu-Dar, (along Amu-Dar and irrigation ditches), Pam. -Al. (south-west. part). Gen. Distr.: Canary Islands and Azores, Atl. Eur. (Portugal), West. and East. Medit., Balk. -As. Min. Described from Spain. Type in London.

Cultivated and turning wild in Central Asia. Culms used in building and for fuel.

Known in fossilized state: *A. donax* from the Pliocene (?) Pribalkh. (Chingistan), from the Miocene of Alt. (Bukhtarma); *A. Göppertii* Heer from the Eocene of Mid. Dnep. region (Lava), from Prichern. Sarmat. (Orehov, Krynka Riv.), and *A. sp.* from Tertiary layers of Sakhalin.

Genus 148. PHRAGMITES† ADANS.††

Adans. Fam. Pl. II (1763) 34; Trin. Agron. (1820) 134.

Spikelets 3-7-flowered, laterally compressed, with somewhat distant florets; the lowest floret staminate, with a glabrous rachilla segment, other florets perfect, rachilla clothed with long hairs; one of the glumes much longer than the other, both glumes membranaceous, keeled, acute; lemmas lanceolate, with a long, subulate point; palea much shorter than the lemma, with 2 keels; stamens short-linear; stigmas plumose; caryopsis oblong. Very large grasses with pyramidal panicle.

* Name applied by ancient Romans to reed.

** Compiled by E. Lavrenko.

† From the Greek word phragmites, used by Dioscorides to indicate plants employed for the making of fences.

†† Compiled by E. Lavrenko and V. Komarov.

1. Spikelets short, 5-7 mm in length; panicle 13-18 cm long; ligule obsolete and hairless; plants producing long stolons 3. *Ph. serotina* Kom.
 + Spikelets 10-15 mm long; panicle 20-30 (50) cm long; ligule with a ring of hairs ca. 1-1.5 mm long; plants usually rhizomatose 2.
 304 2. Lemmas (including the lowest) not more, and mostly less, than twice the length of the longest upper glume; panicle to 30 cm long 1. *Ph. communis* Trin.
 + Lemmas more than twice as long as the upper glume; the aristate points of lemmas breaking off readily; panicle to 50 cm long, very dense and broad 2. *Ph. isiacs* (Del.) Kunth.

1. *Ph. communis* Trin. Fund. Agrost. (1820) 134; Shmal'g. Fl. II, 622; Kryl. Fl. Zap. Sib. II, 250. - *Arundo vulgaris* Lam. Fl. de France III (1778) 615 (nom. mort. nat.). - *A. phragmites* L. Sp. Pl. (1753) 81; Griseb. in Ldb. Fl. Ross. IV, 393. - *A. vulnerans* Gilib. Exerc. phytol. II (1792) 541. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 108, fig. 1729. - Exs.: HFR No 145.

Perennial with long, stout, rhizomes, rarely stoloniferous (var. *stolonifera* Mey.); culms 0.8-4 (9) m tall, erect, very rarely procumbent (var. *subuniflora* DC.), to 12 mm in diameter, hollow, smooth, leafy all the way up; leaves grayish or glaucous-green right up to flowering, sheaths closely enveloping the culm, blades 1.5 cm broad, long, linear-lanceolate, flat, rigid, prominently scabrous-margined (in var. *rivularis* Ldb. very narrow, shortened, involute, often spiny at the apex; the entire plant low, growing on saline soils); ligule transformed into a small shaft bearing a compact row of hairs. Panicle rather dense, more rarely loose, 20-30 (50) cm long, its lowest node hairy, branches and branchlets prominently scabrous; spikelets 9-12 (15) mm long, dark- or brownish-purple, more rarely yellowish; glumes lanceolate, the upper more than twice as long as the lower; lemma produced into a long, thin, subulate point, 3 times its own length; anthers purple. July-October. (Plate XXIII, Figure 9).

Marshes, overgrown lakes, flats, water meadows, borders of streams and lakes, as a weed, etc. All over the Union except the arctic; forming particularly extensive thickets in Central Asia and in estuaries of the rivers flowing into the Black and Caspian Seas. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. When young, very suitable as fodder for horses and cattle, as it contains a large amount of sugars and proteins, but later it becomes rapidly lignified and unfit for feeding. It is of particularly great importance as fodder in Central Asia, by the coasts of Caspian and Aral Seas, and along borders of lakes and rivers. Average cut 8-9 tons per hectare, but it attains sometimes as much as 20 tons. Should be cut before flowering. Suitable for silage. A fairly nutritious bread can be made from the dried and crushed rhizomes of the reed. It also has wide application in the farm household; it provides an abundant supply of fuel, it is used for thatching, fencing, and light constructions, and in Muinak by the Aral Sea also for the erection of large stores for fish preservation; it is incorporated as chaff in adobe bricks; recently an application has been found for it in the manufacture of a new material consisting of pressed slabs, the so-called "kamyshit"; it also serves as a cork substitute. In addition, it is used for various articles, such as cigarette-holders, pipes, etc., while

narrow strips of the culms are used for mats, baskets, and other domestic articles. Quite suitable for production of paper. Where the water table is high, it is used for consolidation of sand dunes. Employed fresh-cut as green manure, and dried as litter. Inflorescences are utilized for brooms and for dry bouquets. The fungus *Scirrhia rimosa* Fuck. which forms dark stripes on the leaves, is toxic and may cause poisoning of domestic animals.

2. *Ph. isiaca* (Del.) Kunth, Rev. Gram. (1829) 80; Grossg. Fl. Kavk., I, 93. — *Ph. gigantea* J. Gay ex Boiss. Fl. Or. V (1884) 563. — *Arundo isiaca* Del. Aeg. Illustr. (1813) 4. — *A. phragmites* β *isiaca* Griseb. in Ldb. Fl. Ross. IV (1853) 394.

Perennial. Resembling *Ph. communis*, but distinguished by its large size; culms 3–8 m tall; panicle 50 cm long and broad; lemmas (at least in the lowest floret) more than twice as long as the upper glume and terminating in a thin aristate point which breaks off readily (especially in fruiting specimens), the lemma thus becoming short and blunt. July–October.

Coastal marshes, water-logged strips along water bodies. — European part: Low. Volg.; Caucasus: South. Transcauc.; Centr. Asia: Kyz. — Kum. (along Amu-Dar. River), Turkmen. Gen. Distr.: East. Medit., North Afr., Iran, Ind. — Him. Described from Egypt. Type in Montpellier.

3. *Ph. serotina* Kom. sp. nova in Addenda p. 751.

Perennial. Rootstock creeping, producing very long, green or purple stolons rooting at the nodes; culms 1–2 m tall, erect, attaining full development only by the end of summer; leaves 1–2 cm broad, with a long, subulate apex and prominently scabrous margins (the marginal prickles are readily visible with sixfold magnification); ligule frequently obsolete, forming a spiny callosity, very rarely fringed with hairs. Panicle 15–20 cm long, often not more than 5 cm broad, not dense; spikelets dingy purple, 3–5-flowered, less than 1 cm long, about half as long as in *Ph. communis*; all bracts thin, with weakly developed nerves and keels, lateral nerves often obscure; glumes 3 and 5 mm long; lemmas to 6 mm long, terminating in a relatively short subulate point. August–October, often November.

In shallows along river banks, on silt or sand deposits. — Far East: Ussur. Endemic. Described from Ussuriiskii Krai, south of Khanka Lake. Type in Leningrad.

NOTE. Differs from *Ph. communis* at first sight in its spikelets which are one-half the size, borne on slender, subcapillary pedicels; it is more closely related to *Ph. japonica* Steud. and especially to its variety *prostrata* Makino (*Ph. prostratus* Makino in Tokyo Bot. Mag. XXVI (1912) 237) from which it differs chiefly in the shape of lemmas.

Known in fossilized condition: *Ph. communis* Trin. from the post-Pliocene of Upp. Dnep. (Minsk, Smolensk) and Volg. Don; *Ph. oenigensis* A. Br. from the Eocene of Mid. Dnep. (Lava), from Prichern. Sarmat (Orekhov, Krynk), from the Miocene of Aral. — Casp. (Dzhilanchik, Chagan, Asyu-Tosty), and from the Pliocene of West. Transcauc. (Goderskii Pass), *Ph. alaskana* Heer from the Paleocene of Ussur. (Amagu River); *Ph. sp.* from Tertiary formations of Pribalkh. (Ashutas, Manrak). In addition, *Ph. communis* has been found in inter-glacial formations of Volg. — Don., Upp. Volg. (Likhvin), and Low. Don.

Genus 149. SIEGLINGIA* BERNH.

Bernh. Syst. Verz. Pl. Erf. (1800) 20, 44.

Inflorescence a narrow, contracted panicle. Spikelets of medium size, 3-5-flowered, the upper floret imperfect. Glumes longer than the florets, strongly convex, keeled. Rachilla brittle, hairy below the floret. Lemma many-nerved, 3-toothed at the summit. Palea with 2 silky-ciliate keels. Lodicules succulent, bilobed. Caryopsis naked. Perennials.

1. *S. decumbens* (L.) Bernh. Fl. Erf. I (1800) 44. - *Festuca decumbens* L. Sp. Pl. (1753) 75. - *Danthonia decumbens* Lam. et DC. Fl. Fr. III (1805) 33. - *Triodia decumbens* P.B. Agrost. (1812) 179; Griseb. in Ldb. Fl. Ross. IV, 400; Shmal'g. Fl. II, 624; Grossg. Fl. Kavk. I, 93. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 71, fig. 1572. - Exs.: HFR No 194; Fl. Cauc. exs., No 54.

Perennial. Forming dense tufts; culms 20-40 cm tall, glabrous, slender, sometimes trailing; leaves linear, ca. 2-3 mm broad, almost smooth; leaves and blades sometimes with long, spreading hairs; ligule a fringe of hairs. Panicle short, 3-8 cm in length, containing 4-12 spikelets, naked; spikelets oblong, 2-3-flowered, 7-9 mm long, whitish-green or faintly purplish; glumes subequal, longer than the lemmas, keeled; lemma with tufts of hairs ca. 0.5-1 mm long at the base, 3-toothed at the summit. April-September. (Plate XXIII, Figure 11).

309 Dry forest glades and coppices. - European part: Kar.-Lap., Lad., -P'm., Upp. Volg., Upp. Dnep., Crimea; Caucasus; West. Transcauc. Gen. Distr.: Scand. (south, part), Centr. and Atl. Eur., West. Medit., Balk. - As. Min. Described from Europe. Type in London.

NOTE. This plant occurs in two biological forms: cleistogamous, with closed florets, and chasmogamous, with florets opening at anthesis. The first form, the more common, has a contracted panicle and spikelets devoid of lodicules; the second, very rare, has a rather open panicle and spikelets with well developed lodicules.

ECONOMIC IMPORTANCE. Of some importance as forage when young.

Genus 150. DIPLACHNE** P. B.

P. B. Agrost. (1812) 80.

Inflorescence a rather loose panicle. Spikelets perfect, 2-5-flowered, lanceolate, laterally compressed, chasmogamous (opening) or cleistogamous (closed). Glumes unequal, membranaceous, 1-nerved, acuminate. Lemma longer than the glumes, 5-nerved, keeled, narrowly lanceolate, bidentate at the summit, usually awned. Palea with 2 keels, also bidentate. Lodicules present only in chasmogamous florets. Stamens 3. Pistils with dark red, plumose stigmas. Caryopsis oblong.

1. Usually not exceeding 20 cm in height; culms with serpentine contortions when dry 1. *D. squarrosa* (Trin.) Maxim.

* Named for Professor Siegling who studied the plants of the surroundings of Erfurt around 1800.

** From Greek diplos=double, and achne=apex, alluding to the bidentate lemma.



- + Usually 20-60 cm tall; culms always erect; spikelets 3-5-flowered 2.
- 2. The short young stolons at the base of culms covered with scalelike leaves; leaves flat; spikelets naked . . . 2. *D. serotina* (L.) Link.
- + No scaly stolons shoots at the base of culms; all shoots leafy; leaves folded or involute . . . 3.
- 3. Plants ca. 20 cm tall; ligule with long, spreading hairs; spikelets awnless . . . 4. *D. songorica* Roshev.
- + Plants 30-60 cm tall; ligule without long hairs; spikelets awned . . . 4.
- 4. Tufts compact; spikelets naked or nearly so . . . 3. *D. bulgarica* (Bornm.) Roshev.
- + Tufts not compact. Spikelets with rather long hairs on the margins of lemmas . . . 5. *D. sinensis* Hance.

310 1. *D. squarrosa* (Trin.) Maxim. in Bull. Soc. Nat. Mosc. LIV. 1 (1879) 71; Shmal'g. Fl. II, 623; Kryl. Fl. Zap. Sib. II, 252. - *Molinia squarrosa* Trin. in Ldb. Fl. alt. I (1829) 105; Griseb. in Ldb. Fl. Ross. IV, 396, -lc.: Ldb. Ic. Fl. Ross. (1831) tab. 227. - Exs.: HFR No 648 (sub *Molinia*).

Perennial. Forming dense tufts; culms 12-20 cm long, flattened, flexuous when dry, smooth, leafy; leaf sheaths on the bent culm open all the way down and diverging from the culm; leaves attenuate-acuminate, the upper subulate-reflexed, the lower rather flat, with scabrous margins; ligule ciliate. Panicle few-branched, contracted, more rarely open, to 7 cm long, few-flowered; spikelets 1-3-flowered, ca. 7-8 mm long, green or purplish; glumes unequal, the lower 1/3-1/2 as long as the upper which is 4-5 mm long; lemma ciliate on the margin, the awn as long or half as long as its lemma. June-July. (Plate XXIII, Figure 12, a).

Steppe slopes. - European part: Zavolzh., Prichern.; Caucasus: Dag.; West. Siberia: Upp. Tob., Irt., Alt.; East. Siberia: Ang. - Sayan., Daur.; Centr. Asia: Aral. - Casp., Pribalkh., Dzung. - Tarb. Gen. Distr.: Dzung. - Kashg., Mong. Described from Altai. Type in Leningrad.

ECONOMIC IMPORTANCE. In southwestern Kazakhstan it is considered as a good, or even fattening forage.

2. *D. serotina* (L.) Link, Hort. Berol. I (1827) 155; Shmal'g. Fl. II 623 pro parte. - *Festuca serotina* L. Sp. Pl. ed. 2 (1762) 111. - *Molinia serotina* M. et K. Deutschl. Fl. I (1823) 585; Griseb. in Ldb.

Explanation to Plate XXIII

1. *Pappophorum persicum* (Boiss.) Steud., spikelet. - 2. *P. boreale* Griseb., spikelet. - 3. *Echinaria capitata* (L.) Desf., spikelet. - 4. *Ammochloa palaestina* Boiss., whole plant, a) spikelet. - 5. *Sesleria coerules* (L.) Ard., inflorescence, a) spikelet, b) lemma. - 6. *S. phleoides* Stev., inflorescence, a) spikelet, b) lemma. - 7. *S. autumnalis* (Scop.) F. Schum., inflorescence, a) spikelet, b) lemma. - 8. *Arundo Donax* L., spikelet. - 9. *Phragmites communis* Trin., spikelet. - 10. *Cortaderia dioica* (Spreng.) Speg., inflorescence, a) pistillate flower, b) staminate flower. - 11. *Sieglingia decumbens* (L.) Bernh., spikelet. - 12. *Diplachne squarrosa* (Trin.) Maxim., whole plant, a) spikelet. - 13. *D. serotina* (L.) Link., radical portion of the plant and spikelet. - 14. *D. bulgarica* (Bornm.) Roshev., spikelet. - 15. *D. songorica* Roshev., spikelet. a) portion of leaf and sheath with ligule. - 16. *D. sinensis* Hance, spikelet. - 17. *Molinia coerules* (L.) Moench, inflorescence, a) spikelet. - 18. *M. litoralis* Host., inflorescence, a) spikelet.

Fl. Ross. IV, 396 pro parte. -Ic.: Rchb. Ic. Fl. Germ. I tab. 71, fig. 1571. -Exs.: Kneuck. Gram. exs. No 345.

Perennial. Forming loose tufts; rhizome short-creeping and bent, scaly, short stolons; culms 20-60 cm tall, erect, smooth below, scabrous above; leaves flat, ca. 5 mm broad, lanceolate-acuminate, rather scabrous; ligule very short, ciliate. Panicle to 8 cm long, contracted, more rarely open, with prominently scabrous axis, the branches each bearing several spikelets; spikelets 6-10 mm long, 1-5-flowered, rather dark purple; glumes 1.5-3 mm long, unequal, lanceolate, thin-coriaceous; lemma narrowly lanceolate, with 5 puberulent nerves, hairs ca. 0.5 mm long at the base, and awn ca. 1 mm long from the summit. July-August. (Plate XXIII, Figure 13).

Dry and stony slopes. -European part: Caucasus: South. Transcauc. (Armen.). Gen. Distr.: north. part of Medit., Balk. -As. Min. Described from northern Italy. Type in London.

ECONOMIC IMPORTANCE. The seeds are sometimes used for food.

3. *D. bulgarica* (Bornm.) Roshev. sp. nov. in Addenda p. 751. -*D. serotina* subsp. *bulgarica* Bornm. Bot. Centralbl. XXXVI (1888) 156. -*D. serotina* Shmal'g. Fl. II, 623 ex parte; Groosg. Fl. Kavk. 194, ex parte, non Link. -*Z. bolgarskaya* [Bulgarian].

- 311 Perennial. Tufted; rhizome short-creeping, slender, scaly stolons absent; culms very slender, ca. 1 mm thick, 60 cm tall, glabrous, smooth, usually reddish-purple; leaves narrowly lanceolate, acuminate, more or less folded; blades and sheaths scaberulous, with prominently scabrous margins; ligule very short, ciliate. Panicle to 8 cm long, nearly always contracted, with prominently scabrous branches, few-flowered; spikelets 6-8 mm long, 1-3-flowered, usually green or light gray; glumes 2.5-4.5 mm long, unequal; lemma narrowly lanceolate, attenuate-acuminate, produced into awn up to 2 mm long, glabrescent at the base, with glabrous or scantily hairy margins. July-September. (Plate XXIII, Figure 14).

Dry and stony slopes. -European part: Mid. Dnep., Priclern., Low. Don.; Caucasus: Ciscauc., Dag., West and East. Transcauc. Gen. Distr.: Balk. -As. Min. Described from Bulgaria. Type in Weimar, Germany.

4. *D. songorica* Roshev. sp. nova in Addenda p. 751.

Perennial. Forming dense, compact tufts; rhizome short-creeping, stolons lacking; culms 20-25 cm tall, glabrous, smooth, surrounded at the base by numerous shorter sterile shoots; leaves linear, long-acuminate, to 2 mm broad, more or less folded, rigid, only slightly scabrous; ligule very short, ciliate, with sparse, long, soft hairs on the sides. Panicle 2-4.5 cm long, open, diffuse, few-flowered; spikelets small, 3-5 mm long, 2-5-flowered, more or less purple; glumes unequal, 1.5-3 mm long, hyaline; lemma lanceolate or partly puberulent, awnless or with an awn-point. July-August. (Plate XXIII, Figure 15, a).

Stony slopes. -Centr. Asia: Dzung. -Tarb. Endemic. Described from Kazakhstan (Dzharkentskii Raion, southeastern part, between the rivers Charyn and Chilik, 17 August 1908. M. I. Ptashitskii). Type in Leningrad.

5. *D. sinensis* Hance in Journ. Bot. VIII (1870) 76. -*D. serotina* var. *chinensis* Maxim. in Bull. Soc. Nat. Moscou IV (1879) 70. -*D. serotina* Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 253, non Link. -Ic.: Kom. and Al. Opred. (Determin.) I, tab. 56.

Perennial. Forming loose tufts; rhizome very short, obsolete; culms slender, ca. 1 mm thick, to 60 cm tall, erect, glabrous, smooth, leafy

right up to the inflorescence; leaves to 5 mm broad, long-acuminate, flat or more or less folded, almost smooth or scabrous; ligule very short, ciliate. Panicle not dense, rather contracted, ca. 5 cm long; spikelets 5-8 mm long, 3-5-flowered, more or less purple-tinged; glumes unequal, usually obtusish; lemma lanceolate, with long, soft, rather sparse hairs on the margins, serrate at the summit, with awn to 2 mm long. July-August. (Plate XXIII, Figure 16).

- 312 Stony slopes, -West, Siberia: Alt. (Katun?); East, Siberia: Ang.-Sayan., Daur.; Far East: Ze.-Bur., Ussur. Gen. Distr.: Jap.-Chin. Described from northern China. Type in London.

Genus 151. MOLINIA* SCHRANK

Schrank, Baier, Fl. I (1789) 334.

Inflorescence a narrow, long, contracted, more rarely loose, panicle. Spikelets lanceolate, 2-5-flowered, upper floret imperfect. Glumes shorter than lemmas, 1-nerved. Lemma 3-5-nerved, subobtus, rounded on the back. Rachilla puberulent or glabrescent. Palea 2-keeled, slightly shorter than the lemma. Lodicules obovate, obtuse. Stamens 3, dark purple. Stigmas plumose.

1. Leaves 3-6 (-8) mm broad; panicle narrow, contracted to subspicate, 10-25 cm long 1. *M. coerulea* (L.) Moench.

+ Leaves 10-15 mm broad; panicle loose, to 60 cm long 2. *M. litoralis* Host.

1. *M. coerulea* (L.) Moench, Meth. (1794) 183; Griseb. in Leb. Fl. Ross. IV, 395; Shmal'g. Fl. II, 622; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 254. -*Aira coerulea* L. Sp. Pl. (1753) 63. -*Melice coerulea* L. Mant. II (1771) 235. -*Festuca coerulea* Lam. et DC. Fl. Rf. III (1805) 46. -*lc.*: Rchb. *lc.* Fl. Germ. I, tab. 78 fig. 1606. -*Exs.*: HFR No 446.

Perennial. Tufts small, compact, with tough, rather long rhizomes; culms erect, smooth, 40-70 cm tall, more rarely 70-90 cm (var. *robusta* Pohl.) or even to 150 cm (var. *arundinacea* (Schrank) Asch.), leafy only at the base, quite bare above; leaves linear-lanceolate, long-acuminate, flat, scabrous on the margin, usually covered on the upper surface with fairly long, rather sparse hairs; ligule ciliate. Panicle narrow, contracted, to 30 cm long, sometimes spikelike (on damp solonchaks var. *salsuginosa* N. Pavl.), short-branched, more rarely expanded, with long branches (var. *arundinacea* (Schrank) Asch.); spikelets dark purple, more rarely green (var. *viridiflora* Lejeune), to 6 (-8) mm long, 2-4-flowered; glumes 3-4 mm long, ovate, subobtus, sometimes brownish, pointed; lemma 3-6 mm long, distinctly nerved, always shorter than the palea. June-September. (Plate XXIII, Figure 17, a).

Meadows, moors, forests, and coppices; occasionally on damp solonchaks. -European part: all regions; Caucasus: Ciscauc., West. and South. Transcauc.; West. Siberia: Ob., Upp. Tob., Irt.; Centr. Asia: Aral. -Casp. northwest. part. Gen. Distr.: all Europe, except extreme south, Balk. -As. Min. Described from Europe. Type in London.

* Named for the missionary I. Molina (1740-1828), naturalist, explorer of Chile.

Genus 152. ERAGROSTIS* HOST

Host, Gram. austr. IV (1809) 14.

Inflorescence an open, more rarely contracted or interrupted, panicle. Spikelets many-flowered, linear-oblong, laterally compressed, perfect. Glumes shorter than the lemmas and paleas, 1-nerved, the upper slightly longer than the lower. Lemmas 3-nerved, falling together with the grain. Palea with 2 keels. Stamens 3. Stigmas plumose. Caryopsis ovoid-spherical.

1. Perennial plant. Rachilla brittle. Spikelets falling entire after flowering 9. *E. arundinacea* (L.) Roshev.
 + Annuals, rarely perennials. Rachilla not brittle; lemma falls off at maturity while palea is retained on the rachilla. 2.
 2. Spikelets small, not exceeding 1.5-2 mm in length 1. *E. Kossinskyi* Roshev.
 + Spikelets larger, 3-10 mm long 3.
 3. Leaves and sheaths without warty glands on the nerves. 4.
 + Leaves and sheaths with warty glands on the nerves. 6.
 4. Perennial; spikelets elliptical, 2-2.5 mm broad 2. *E. nigra* Nees.
 + Annual; spikelets linear-lanceolate, 1-1.5 mm broad 5.
 5. Inflorescence branches with long, slender hairs at the base; spikelets 3-5 mm long, 5-9-flowered 3. *E. pilosa* (L.) P. B.
 + Inflorescence branches hairless at the base; spikelets to 10 mm long, 15-20-flowered 4. *E. aegyptiaca* (Willd.) Del.
 314 6. Leaves and sheaths sparsely covered with long hairs 5. *E. minor* Host.
 + Leaves and sheaths quite glabrous 7.
 7. Panicle dense, narrow, contracted 8. *E. Starosselskyi* Grossh.
 + Panicle rather open, loose 8.
 8. Spikelets rather small, 4-11 mm long, 5-20-flowered 6. *E. suaveolens* Beck.
 + Spikelets rather large, ca. 2 cm long, 20-30 (-50)-flowered 7. *E. megastachya* (Koel.) Link.

1. *E. Kossinskyi* Roshev. in Bull. Jard. Bot. Princip. XXVI (1927) 116. - *E. volgensis* Roshev. l. c. XXVII (1928) 96. - Ic.: l. c. (1928) 97 (sub *E. volgensis*).

Annual. Forming small tufts; culms slender, smooth, (7-) 10-50 cm tall; leaves linear-lanceolate, 2-5 mm broad, flat, rather scabrous on the upper surface; ligule very short or lacking. Panicle pyramidal or oblong, many-flowered, rather dense, to 20 cm long and 8 cm broad, with scaberulous branches to 5 cm long; spikelets oblong, 1.5-2 (-2.5) mm long, 4-10-flowered, often more or less purple; glumes and lemmas broadly lanceolate, 3-nerved, obtuse; caryopsis ca. 0.5 mm long, ovoid, dark brown. July-September. (Plate XXIV, Figures 1a, 2a).

* From Greek *erai* = I love, and *agrostis* = name of a kind of grass mentioned by Homer.

Coastal sands. -European part: Low. Volg. Endemic. Described from the Volga estuary. Type in Leningrad.

2. *E. nigra* Nees ex Steud. Nom. ed. 2, 1 (1841) 563; Syn. Gram. (1855) 267.

Perennis! Branching at the base; rhizomes long, fairly stout; culms 15-90 cm tall, glabrous, smooth, surrounded at the base by sheaths of radical leaves; leaves linear, long-acuminate, rather flat, to 3 mm long [sic], densely covered with long hairs at the base and on the upper margin of sheaths, but without glandular warts; ligule consisting of a fringe of hairs. Panicle to 50 cm long, rather open, not dense, branches slender but not capillary, to 10 cm long, usually hairless at the base; spikelets greenish-gray, elliptical, more rarely acuminate, to 8 mm long and 2.5 mm broad, 5-16-flowered; glumes lanceolate, only slightly smaller than the lemmas and paleas; lemma lanceolate, scabrous on the nerves. Caryopsis ca. 1 mm long, oblong. (Plate XXIV, Figure 3).

A weed. -Caucasus: indicated for West. Transcauc. Gen. distr.: East. India, Ceylon. Described from India. Type in Germany (?).

NOTE. Resembling *E. minor* Host in shape and size of spikelets, but differing in the lack of warts on the margins of leaves and sheaths. Introduced to this country into the Caucasus only in recent years.

3. *E. pilosa* (L.) P. B. Agrost. (1812); Griseb. in Ldb. Fl. Ross. IV, 382; Shmal'g. Fl. II, 631; Kryl. Fl. Zap. Sib. II, 257. -*Poa pilosa* L. Sp. Pl. (1753) 38. -*Ec.*: Rchb. Ic. Fl. Germ. I, tab. 91, fig. 1660 et 1659; Kom and Al. Oprod. (Determin.) I, tab. 57. -*Exs.*: HFR, No 96.

Annual. Branching at the base; culms 10-40 cm long, rather ascending; smooth; leaves narrowly linear, flat or rather involute, glabrous; blades and sheaths without warty glands on the margin; ligule consisting of a fringe of hairs. Panicle to 15 cm long, rather open, with long, slender hairs at the base of lower branches; spikelets rather grayish-purple, linear-lanceolate, 3-5 mm long, 5-9-flowered; glumes lanceolate, much smaller than the lemmas and paleas; lemma hyaline at the summit; palea persisting on the rachilla after flowering. July-August. (Plate XXIV, Figure 4, a, b).

Sandy places. -European part: all regions except the northern regions (Kar., -Lap., Dv. -Pech., and Lad. -Il'm.); Caucasus: all regions; West. Siberia: Upp. Tob., Irt., Alt.; East. Siberia: Daur.; Far East: Ze-Bur., Ud., Ussur.; Centr. Asia: all regions. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk. -As. Min., Arm. -Kurd., Iran, Ind. -Himal., Dzung. -Kashg., Mong., Jap. -Cjin., N. Am. Described from Italy. Type in London.

ECONOMIC IMPORTANCE. Readily eaten by livestock, but occurs in small quantity.

4. *E. aegyptiaca* (Willd.) Del. Fl. d'Egypte (1814) 157; Griseb. in Ldb. Fl. Ross. IV, 382. -*Poa aegyptiaca* Willd. Enum. hort. Berol. (1809) 107. -*E. pilosa* P. B. var. *aegyptiaca* Schmalh. in Fl. II (1897) 631. -*Ec.*: Del., l. c., tab. 4, fig. 2. -*Exs.*: HFR, No 1544.

Annual. Branching at the base; culms 8-40 cm long, slender, glabrous, smooth; leaves linear, to 3 mm broad; blades and sheaths glabrous, prominently scabrous on the margin; ligule consisting of a fringe of hairs. Panicle to 15 cm long, rather contracted, many-flowered, branches smooth, with hairless pulvini. Spikelets linear, 15-20-flowered, to 10 mm long;

glumes lanceolate-acuminate; lemma 3-nerved; palea persisting on the rachilla after flowering. July–September. (Plate XXIV, Figure 5, a, b).

Sandy banks. –European part: Upp. Dnep., Mid. Dnep. Gen. Distr.; East. Medit., Egypt. Described from Egypt. Type in Berlin.

5. *E. minor* Host, Gram. austr. IV (1809) 15; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 256. –*Poa Eragrostis* L. Sp. Pl. (1753) 68. –*Eragrostis poaeoides* P. B. Agrost. (1812) 162; Griseb. in Ldb. Fl. Ross. IV, 381; Shmal'g. Fl. II, 630. –*lc.*: Rchb. *lc.* Fl. Germ., I, tab. 91, fig. 1661. –*Exs.*: HFR. No 397 (sub *E. poaeoides*).

316 Annual. Forming small tufts; culms 10–50 (–70 var. *luxurians* Grossh.) cm tall, branching at the base, rather ascending, slender, smooth; leaves linear; blades and sheaths sparsely clothed with long, spreading hairs and with warty glands on the margin; ligule consisting of a fringe of hairs. Panicle open, with branches arranged singly or in pairs; spikelets grayish, 4–11 mm long, 5–20-flowered; glumes shorter than the lemmas, and paleas somewhat unequal; lemma ovate, obtuse, scabrous on the nerves; caryopsis ca. 1 mm long. July–August. (Plate XXIV, Figure 6, a, b).

Sandy places. –European part: Upp. Volg., Volg. –Kam., Upp. Dnep., Mid. Dnep., Volg. –Don., Zavolzh., Prichern., Crimea, Low. Volg.; Caucasus: all regions; West. Siberia: Upp. Tob., Irt., Alt., East. Siberia: Ang. –Sayan, Daur.; Far East: Ussur.; Centr. Asia: all regions. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk. –As. Min., Arm. –Kurd., Iran, Ind. –Himal., Dzung. –Kashg., N. Am. Described from Italy. Type in London.

ECONOMIC IMPORTANCE. Often occurring as a weed; readily eaten by livestock. Used for dry bouquets; an ornamental grass.

6. *E. suaveolens* Beck. ex Claus. in Beitr. Pflanzk. Russ. Reich. VIII (1851) 266. –*E. poaeoides* v. *suaveolens* Schmalh. in Fl. II (1897) 631. –*E. suaveolens* Beck. v. *borysthonica* Schmalh. in Zap. Kievsk. Obshch. Estetstv. (Mem. Kiev Nat. Soc.) XI (1891) 73. –*Exs.*: HFR No 246.

Annual. Tufted; culms 20–60 cm tall, ascending, slender, smooth; leaves linear, glabrous; blades and sheaths with warty glands; ligule consisting of a fringe of hairs. Panicle open, with long branches; spikelets shorter than their pedicels, 4–11 mm long, 5–20-flowered, grayish. Glumes slightly shorter than the lemmas and paleas, somewhat unequal; lemma ovate, without warts on the keel. August–September. (Plate XXIV, Figure 7, a, b).

Coastal sands. –European part: Upp. Dnep., Volg. –Kam., Volg. –Don., Zavolzh., Prichern., Low. Don., Low. Volg.; Centr. Asia: Aral. –Casp., Pribalkh. Endemic. Described from the banks of Middle Volga. Type in Leningrad.

ECONOMIC IMPORTANCE. Considered as a forage plant.

Explanation to Plate XXIV

1, 2–*Eragrostis Koszinskyi* Roshev., inflorescence, a) spikelet. –*E. nigra* Nees, spikelet; 4–*E. pilosa* (L.) P. B., inflorescence, b) base of leaf, a) spikelet; 5–*E. aegyptiaca* (Willd.) Del., inflorescence, a) spikelet, b) base of leaf; 6–*E. minor* Host., inflorescence, a) spikelet, b) base of leaf and upper portion of sheath; 7–*E. suaveolens* Beck., inflorescence, a) spikelet, b) base of leaf and upper portion of sheath; 8–*E. megastachya* (Koel.) Link., inflorescence, a, b) spikelets; 9–*E. Starostskyi* Grossh., inflorescence, a) spikelet; 10–*E. arundinacea* (L.) Roshev., inflorescence, b) radical part.



7. *E. megastachya* (Koel.) Lindk. Hort. Berol. I (1827) 187; Griseb. in Ldb. Fl. Ross. IV, 382; Shmal'g. Fl. II, 631; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 256. - *Poa megastachya* Koel. Descr. gram. (1802) 181. - *Briza Eragrostis* L. Sp. Pl. (1753) 70. - *Eragrostis multiflora* Aschers. Fl. Brand. I (1864) 841. - *Eragrostis major* Host, Gram. austr. IV (1809) 14. - Ic.: Host, l. c., tab. 24; Rchb. Ic. Fl. Germ. I, tab. 91, fig. 1662. - Exs.: Kneucker, Gram. exs. No 119. - *P. krupnokoloskovaya* [with large spikelets].

Annual. Tufted; culms 10-40 cm tall, branching at the base, glabrous, smooth; leaves linear, flat, with a tuft of hairs at the base, with glandular tubercles on the nerves; ligule consisting of a tuft of hairs. Panicle to 25 cm long, with rather spreading branches; spikelets usually (10)-20-30-flowered (-50-flowered in var. *multiflora* Roshev.), elongate-ovate-lanceolate, to 2 cm long; glumes ca. 2 mm long, shorter than the lemmas and paleas; lemma ovate, obtuse. May-August. (Plate XXIV, Figure 8, a, b).

Weed-infested places. - European part: Crimea; Caucasus: Ciscauc., East. Transcauc.; Centr. Asia: Pribalkh., Dzung.-Tarb., Kyz.-Kum., Upp. Turkm., Amu-Dar., Syr-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk.-As. Min., Arm.-Kurd., Iran, Ind.-Him., Dzung.-Kashg., Jap.-Chin. Described from southern Europe. Type in London.

ECONOMIC IMPORTANCE. Considered as a forage plant of secondary importance.

8. *E. Straosselskyi* Grossh. in Not. Syst. Herb. Horti Bot. Petrop. IV (1923) 18. - *Eragrostis megastachya* var. *compacta* Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II (1928) 257. - *E. poaeoides* β *compacta* Rgl. in Bull. Soc. Nat. Mosc., XLII, 4 (1868) 295. - Exs.: Grossh. et Schischk. Pl. Or. exs. (1928) No 251.

Annual. Tufted; culms 50-70 cm tall (10-20 cm - var. *pumila* Grossh.), stout, often branching in upper part; leaves linear, flat, with a tuft of hairs at the base; blades and sheaths glabrous, with small glandular warts on the nerves. Panicle 20-30 cm long, narrow, rather contracted, branches with 1-3 shortened branchlets at base; spikelets ovate, subacute, 5-7 mm long, 6-12-flowered; glumes and lemmas ovate-circular, rather pointed at the summit. (Plate XXIV, Figure 9, a).

Steppes and steppe-mountain slopes. - Caucasus: East. Transcauc.; Centr. Asia: Pribalkh., Dzung.-Tarb., Upp. Turkm., Amu-Dar., Syr-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: Iran, Dzung.-Kashg. Described from the Caucasus. Type in Tiflis.

9. *E. arundinacea* (L.) Roshev. comb. nov. - *Aira arundinacea* L. Sp. Pl. (1753) 64. - *Poa tatarica* Fisch. in Besser. Cat. II, Suppl. (1816) 13; Griseb. in Ldb. Fl. Ross. IV, 381; Shmal'g. Fl. II, 633. - *Poa arundinacea* Link. Hort. Berol. I (1827) 76. - *Eragrostis colina* Trin. in Mem. Acad. Sc. Petersb., ser. 6, I (1831) 413. - *Poa colina* C. Koch in Linnaea XXI (1848) 405. - Exs.: HFR No 2675.

Perennial. A glaucous plant, with short-creeping rhizomes; culms 30-110 cm tall, stout, erect, rigid, glabrous; leaves linear-acuminate, flat or rather involute; blade and sheaths glabrous, prominently scabrous on the margin; ligule consisting of a row of hairs. Panicle large, to 25 cm long and 12 cm broad, pyramidal; inflorescence branches spreading,

- solitary, smooth, with spikelets crowded at the ends; spikelets 2-5-flowered, small, ca. 2 mm long, dark dingy-green; glumes unequal, shorter than the lemmas and the paleas; lemma 3-nerved, subobtusate; caryopsis ca. 1 mm long, round. June-July. (Plate XXIV, Figure 10, a, b).
- 320 Saline places and sandy solonchaks. -European part: Zavolzh., Low. Don., Low. Volg.; Caucasus: Ciscauc., Dag., East. and South. Transcauc.; West. Siberia: Upp. Tob.; Centr. Asia: Aral. -Casp., Syr-Dar. Gen. Distr.: Arm., -Kurd., Iran. Described from East. Mediterranean. Type in London.

ECONOMIC IMPORTANCE. Gives coarse fodder, especially after flowering, but deserves attention as a salt-resistant plant.

Genus 153. KOELERIA* PERS.**

Pers. Syn. I (1805) 97.

Inflorescence a compact, spikelike, cylindrical or oblong-oval, or rather loose, lobed panicle. Spikelets 2-5-(rarely 1)-flowered, laterally compressed; rachilla jointed, glabrous or short-hairy; glumes keeled, subacute, somewhat unequal, the outer smaller, without nerves, the inner larger, resembling the lemmas, with 3 obscure nerves. Lemmas herbaceous, keeled, mostly slightly longer than glumes, with 3 thin, faint nerves, lanceolate to oval-lanceolate. Paleas as long as lemmas or somewhat shorter and always narrower than the lemmas, scarious, bidentate. Stamens 3. Anthers oblong, 2-3 mm long. Stigmas plumose. Caryopsis oblong or linear-oblong, convex on the back, concave on the ventral side. Perennial grasses, forming tufts consisting of floriferous culms and shortened, 2-10-leaved sterile shoots which are intravaginal (in this case the plant forms compact tufts) or extravaginal (in the latter case the plant forms loose tufts, mostly with a slender, creeping rhizome).

ECONOMIC IMPORTANCE. Forage grasses in pastures. Most valuable are the mountainous species which participate in the composition of sub-alpine and alpine meadows (*K. caucasica*). Next in importance are species of the plains, of which most widespread in this country are *K. gracilis* (a plant which also grows on steppe-mountain slopes) and *K. glauca*. According to Larin's data, the two latter species are good pasture grasses, mainly in spring and at the beginning of summer; they are, however, inferior to fescue.

1. Lemma awned, the awn attached not less than 1 mm below the summit 2.
- + Lemma awnless, and if awned the awn attached at the very summit. 3.
2. Plant 25-30 cm tall; culm fluffy; panicles pale yellowish, axis and branches fluffy (Plate XXV, Figure 4) 5. *K. Litwinowii* Domin.
- + Plant 12-18 cm tall; culms glabrous; panicles dull purple-tinged, axis and branches glabrous 6. *K. Gorodkowi* Roshev.

* Named for G.L. Koeler of Göttingen (1765-1807), professor at Mainz, who presented the first detailed descriptions of the grasses of France and Germany (1802).

** Compiled by H.F. Goncharov.

3. Spikelets 1-flowered (Plate XXV, Figure 13) 22. *K. monantha* Domin.
- + Spikelets 2- or more-flowered 4.
4. Sterile shoots 5-10-leaved (Plate XXV, Figure 2e) 5.
- + Sterile shoots 2-4-leaved (Plate XXV, Figure 14 b) 8.
5. Glumes obtuse or subobtuse (Plate XXV, Figure 1a); old sheaths 6.
- mostly split longitudinally into threadlike fibers 6.
- + Glumes acute or attenuate-acuminate (Plate XXV, Figure 3a); old sheaths entire or slightly split longitudinally 7.
6. Plant low-growing, 10-18 (24) cm tall; panicle purplish-tawny, spike-like-contracted (Plate XXV, Figure 1b), fairly compact, with very short branches; lemmas oval, roundish-obtuse 1. *K. Pohleana* (Domin) Gontsch.
- + Plant taller, (25) 30-70 cm in height; panicles pale-colored, rarely somewhat purple-tinged, loose or loosish (Plate XXV, Figure 2b), more or less lobed, with rather long branches; lemmas lanceolate, subobtuse 2. *K. glauca* DC.
7. Panicles oval or oval-oblong, very compact, 2-3.5 cm long. (Plate XXV, Figure 3b) 3. *K. Degenii* Domin.
- + Panicles cylindrical or oblong-cylindrical, fairly compact, 5-8 cm long 4. *K. splendens* Presl.
8. Plants forming loose tufts, with rather distinctly creeping rhizomes (Table XXV, Figure 14c) 9.
- + Plants forming compact or somewhat loose tufts, without long-creeping rhizomes 15.
9. Sheaths of culm leaves pubescent or pilose-pubescent 10.
- + Sheaths of culm leaves glabrous 12.
10. Plants 30-120 cm tall; panicles loose, pyramidal-oblong (Plate XXV, Figure 14b), large, 6-14 cm long 23. *K. polonica* Domin.
- + Plants 5-25 cm tall; panicles compact, spike-like or somewhat loose, 1-4.5 cm long (Plate XXV, Figure 15b) 11.
11. Lemmas pilose or villous (Plate XXV, Figure 15a). Sheaths of lower culm-leaves usually soft-pubescent 24. *K. asiatica* Domin.
- + Lemmas naked; sheaths of lower culm-leaves puberulent or very minutely puberulent 25. *K. atrovioacea* Domin.
12. Lemmas pointed 13.
- + Lemmas subobtuse 14.
- 322 13. Leaves of sterile shoots to 40 cm long; culms 40-50 cm tall 26. *K. geniculata* Domin.
- + Leaves of sterile shoots 4-5 cm long; culms ca. 25 cm tall 27. *K. incerta* Domin.
14. Leaves of sterile shoots indurate, glaucous, strongly scabrous, mostly involute; plants 20-22 cm tall 28. *K. barabensis* Domin.
- + Leaves of sterile shoots soft, green, scaberulous; plants 30-80 cm tall 29. *K. Delavignei* Czern.
15. Spikelets very small, 3-3.5 mm long; lemmas oval, subobtuse, without distinct nerves (Plate XXV, Figure 8) 16. *K. poaeformis* Domin.

- + Spikelets 4-6 mm long, very rarely 3 mm long, but in the latter case the lemmas are acute or acuminate, with a pronounced nerve . . . 16.
16. Glumes markedly unequal (Plate XXV, Figure 19); the lower ca. 2 mm, the upper ca. 2.5-3 mm long; lemmas linear-lanceolate, almost entirely hyaline; a perfectly glabrous and smooth plant 15. *K. nitidula* Volen.
- + Glumes less (slightly)unequal; lemmas broader; a more or less pubescent plant or, if glabrous, then the leaves scabrous 17.
17. Old sheaths split into straight threads or very narrow fibers 7. *K. tokiensis* Domin.
- + Old sheaths entire or irregularly torn 18.
18. Leaves of sterile shoots glaucous, hard, very prominently scabrous, 2-3.5 mm broad, erect 19.
- + Leaves of sterile shoots green or somewhat glaucous-green, and if glaucous then mostly narrower or only slightly scabrous. 20.
19. Leaves of sterile shoots 17-25 cm long; panicles 7-10 cm long, contracted, cylindrical 8. *K. sclerophylla* P. Smirn.
- + Leaves of sterile shoots 8-10 cm long; panicles 10-14 cm long, rather loose, oblong- or narrow-pyramidal 9. *K. Thoni* Domin.
20. Lemmas rather stiff, villous or pubescent (Plate XXV, Figures 6, 7, 10, 11) 21.
- + Lemmas glabrous, very rarely faintly puberulent (Plate XXV, Figures 9, 12, 18a) 24.
21. The whole plant villous-pubescent 14. *K. Fominii* Domin.
- + Plant not villous 22.
22. All sheaths hairy, the hairs bent downwards; glumes much shorter than the florets (Plate XXV, Figure 10) 19. *K. sibirica* Domin.
- + Sheaths of lower culm-leaves pubescent or finely woolly-pubescent; glumes slightly or barely shorter than the florets 23.
- 323 23. Palea mostly markedly shorter than the lemma; glumes subhyaline, glabrous; large-tufted plant (Plate XXV, Figure 11) 20. *K. seminuda* (Trautv.) Domin.
- + Palea nearly as long as the lemma, glumes mostly hairy; small-tufted plant (Plate XXV, Figure 6) 10. *T. caucasica* Trin.
24. Panicles compact; leaves of sterile shoots green 25.
- + Panicles loose or somewhat compact, and if strongly contracted then its lower branches are much longer than the upper (rarely compact, spikelike, and then leaves of sterile shoots glaucous) 26.
25. Leaves of sterile shoots 6-10 cm long. Panicles brownish-purple tinged 13. *K. Buschiana* (Domin) Gontsch.
- + Leaves of sterile shoots 25-35 cm long. Panicles pale tawny 12. *K. Ledebouri* Domin.
26. Sheaths of lower culm leaves white-tomentose or white-pilose 27.
- + Sheaths of lower culm leaves glabrous or pubescent, but not vested with white hairs 28.
27. Leaves of sterile shoots 13-25 cm long; uppermost sheath not inflated; panicles pale 17. *K. askoldensis* Roshev.
- + Leaves of sterile shoots 5-8 cm long; uppermost sheath slightly inflated; panicles mostly purple 11. *K. Albovii* Domin.
28. Plants mostly glabrous; leaves of sterile shoots 20-35 cm long 21. *K. Luerssenii* Domin.

+ Plants more or less pubescent, and if glabrous then leaves of sterile shoots shorter. 18. *K. gracilis* Pers.

Section *Bulbosae* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 49. - Base of culm invested in old sheaths and bulbously enlarged.

Subsection *Glaucæ* Domin. l.c. - The lower old sheaths imbricate, splitting into fibers at the end.

1. *K. Pohleana* (Domin) Gontsch. comb. nova. - *K. glauca* var. *Pohleana* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 64.

324 Perennial. Tufts rather loose, rarely fairly compact, the rather short, creeping-ascending rhizomes covered with old leaf sheaths; culm mostly pubescent all the way down, rarely glabrous below; lower sheaths oblong, pubescent on the outside; leaves of sterile shoots glabrous, more rarely minutely puberulent, flat, rarely involute, green, 3-7 cm long and to 1.75 mm broad, scabrous; culm leaves glabrous, flat, green. Panicles cylindrical-oval, more rarely cylindrical, mostly uninterrupted, 2.5-3 (-5) cm long; spikelets ca. 4 mm long, short-pedicel or subsessile, 2-flowered; glumes unequal, obtuse, somewhat shorter than the florets, rarely of same length; palea as long as the lemma. July-August. (Plate XXV, Figure 1a, b).

Sandy plots and slopes in the tundra. - Arctic: Arct. Eur., Kolguev Peninsula. Endemic. Described from Kolguev Peninsula. Type in Leningrad.

2. *K. glauca* DC. Catalog Plant. Hort. Monspel. (1813) 116; Griseb. in Ldb. Fl. Ross. IV, 402; Domin Monogr. in Biblioth. Botan. H. 65 (1907) 54; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 259. - *K. cristata* Pers. e. *glauca* DC. (sp.) Shmal'g. Fl. II, 630 - l.c.: Domin. l.c., tab. II, fig. 11, tab. III, fig. 1, 2.

Perennial. Tufts compact; culms puberulent below the inflorescence, glabrous lower down; culms and sterile shoots bulbously enlarged and covered with old sheaths at the base; lower sheaths of the culm silvery-pubescent, the upper ones mostly glabrous; leaves of sterile shoots 5-12 cm long, straight or somewhat falcately bent, glaucous, scabrous, indurate, flat or rather involute. Panicles cylindrical or broadly cylindrical, more or less lobed; spikelets long- or short-pedicel, 2-3-flowered, 4-5 mm long; glumes unequal, the upper as long as the florets or longer, subobtuse glabrous or faintly puberulent; lemmas lanceolate; palea about as long as the lemma. May-June. (Plate XXV, Figure 2, a, b, e).

Pine woods, slightly sodded or bare sands, dunes. - European part: Lad. - Il'm., Upp. - Volg., Volg.-Kam. (in the south), Upp. Dnep., Mid. Dnep., Volg. - Don., Zavolzh., Prichern., Crimea, Low. - Don. (except southern part), Low. Volg. (except the south); West. Siberia: Ob. (in the south), Upp. Tob., Irt., Alt.; East. Siberia: Ang. - Sayan., Daur. (in west. part); Centr. Asia: Aral. - Casp. (in north. part), Pribalkh. (in north. part). Gen. Distr.: Scand. (in south. part), Centr. and Atl. Eur. (France, Belgium, Holland), Balk. - As. Mier. (in northeastern part). Described from Germany.

Subsection *Imbricatae* Domin. Monogr. in Bibl. Bot. H. 65 (1907), 49. - Lower sheaths entire, imbricate; the bulblike enlargements of culm small.

3. *K. Degenii* Domin, in Mag. Bot. Lap. III (1904) 275. - *K. brevis* auct. p. p. vix Steven in Bull. Soc. Nat. Moscou XXX 1 (1857) 110; Shmal'g.

Fl. II, 630. -*Dactylis lobata* M.B. Fl. taur. -cauc. I (1808) 67 part. -Ic.: Domin., Monogr. in Bibl. Bot. H. 65 (1907) tab. III, fig. 5, 6 tab. IV, fig. 5.

325 Perennial. Tufts compact, but not large; culms glabrous, slender; bases of culms and sterile shoots bulbously enlarged and covered with old, approximate, pale, thin, entire sheaths; leaves of sterile shoots 2-5 cm long, indurate, glaucous, to 1.5-1.75 mm broad, scabrous on the margin, smooth elsewhere; sheaths of old leaves glabrous. Panicles glaucous-pale-green; spikelets very short-pedicelated or sessile, 5-7 mm long, 2-3-flowered; glumes unequal, broadly lanceolate, at most 1/3 as long as the florets, acute; lemmas lanceolate, awn-pointed, awnless or with a short awn (1 1/4 mm) from just below the summit; palea shorter than the lemma. May-July.

Calcareous soils. -European part: Crimea, Prichern. (Kherson and Odessa), Low. -Don (Krasnoarmeisk). Also recorded in Domin's monograph for Kazanskaya Guberniya; Caucasus: East Transcauc. (Azerb.) Gen. Distr.: Balk. -As. Min. Described from Dobrudzha. Type in Budapest.

Subsection *Splendentes* Domin. Monogr. in Bibl. Bot. H. 65. (1907) 50. -Lower sheaths entire indurate; bulbous enlargements of culms large.

4. *K. splendens* Presl. Cyp. et Gram. Sic. (1820) 34; Domin. Monogr. in Bibl. Bot. H. 65 (1907) 89. -Ic.: Domin, l.c., tab. V, fig. 1.

Perennial. Tufts compact, with few culms. Culms with oval-oblong, bulbous enlargement at base, 20-90 cm tall, glabrous, indurate, leafless in upper part; sheaths of sterile shoots and those enveloping the culm base glabrous, glaucous, entire; sheaths of culm leaves glabrous, glaucous; leaves of sterile shoots 4-7.5 cm long, glaucous, stiff, partly or entirely flat, to 2 mm broad, glabrous, scabrous on the margin, with a narrow white fringe. Panicles broadly cylindrical, compact, occasionally somewhat lobed, pale, glossy; spikelets short-pedicelated, 5-7 mm long, 2-3-flowered; glumes markedly unequal, broadly lanceolate, shorter than the florets, glabrous, acute or finely acuminate. Lemmas awn-pointed, pubescent or glabrous, with a broad, translucent fringe. May-August.

Over limestone, in stony places. -European part: Crimea. Gen. Distr.: West. Medit., Balk. -As. Min. (Balkan Peninsula). Described from Sicily. Type in Prague.

Section *Caespitosae* Domin. Monogr. in Bibl. Botan. H. 65 (1907) 50. -Culm not bulbous at base.

Subsection *Caespitosae verae* Domin. l.c. -Plants compactly or somewhat loosely tufted, without creeping rhizomes.

Series 1. *Dorsoaristatae* Domin. l.c. -Spikelets 2-3-flowered. Lemma awned from below the summit.

5. *K. Litwinowii* Domin. Monogr. in Bibl. Bot. H. 65 (1907) 116. -Ic.: Domin, l.c., tab. VII, fig. 3, 4.

326 Perennial. Plants forming compact, large tufts with numerous culms; old lower sheaths entire, oblong, pubescent on the outside; leaves of sterile shoots 12-15 cm long, glaucous, flat, 1-2.5 mm broad, ciliate on the margin, glabrous elsewhere or also ciliate in lower part on the inside; sheaths of culm leaves copiously long-pubescent, the blades flat, to 3-4 mm broad, glabrous, ciliate on the margin. Panicle oblong, loose, lobed, 4-5-7 cm long, more or less interrupted below; spikelets long-pedicelated, 5-5.7 mm long, 2-flowered; glumes unequal, lanceolate or linear-lanceolate,

acuminate, glabrous, short-ciliate on the keel, as long as the florets or nearly so; lemmas linear-lanceolate, acuminate, finely or minutely pubescent; awn scabrous, half as long as its lemma; palea slightly shorter than the lemma. June. (Plate XXV, Figure 4).

Centr. Asia: Tien Shan. Described from Aflatunskii Pass. Endemic. Type in Leningrad.

6. *K. Gorodkowi* Roshev. in Bull. Jard. Bot. Acad. Sc. URSS, XXX (1932) 296. -T. Gorodkova.

Perennial. Tufts small, fairly loose; old lower sheaths few, oblong, entire or only slightly split, pubescent on the outside; leaves of sterile shoots 2-3 in number, green, mostly ciliate, involute, 8-9 (-10) cm long, at most 1 mm broad (when unrolled); sheaths of culm leaves ciliate-pubescent, blades green, flat, to 1.5 mm broad, pubescent on the outside, ciliate on the inside and on the margin. Panicles subspicate-cylindrical, loose in lower part; spikelets 5-6 mm long, 2-3-flowered; glumes markedly unequal, shorter than the florets, glabrous, acute, lanceolate; lemmas lanceolate, subobtusate, scarious-margined, glabrous; awn scabrous, ca. 1 mm long; palea shorter than the lemma. July.

Slopes of sand mounds, -Arctic: Arct. Sib. Described from Gydanskaya Tundra (between Enisei River valley and the Ob' Inlet). Endemic. Type in Leningrad.

Series 2. *Cristatae* Domin Monogr. in Bibl. Botan. H. 65 (1907) 50. - Spikelets 2-5-flowered. Lemma awnless or awned from the summit.

7. *K. tokiensis* Domin, in Bull. Herb. Boiss. ser. V (1905) 948; Domin, Monogr. in Bibl. Bot. H. 65 (1907) 129. -*lc.*: Domin l.c., tab. X, fig. 4, 5.

327 Perennial. Tufts compact; the lower old sheaths, covering the base of the culm, split into straight, threadlike fibers or into very narrow lobes; culms 20-70 cm tall; leaves of sterile shoots glaucous, 1-2 mm broad, mostly glabrous, more rarely covered with stiff hairs. Panicles narrow, to 15 cm long, often somewhat pyramidal, slightly lobed below, fairly compact, pale-colored; spikelets very short-pedicelated or subsessile, 2-flowered, 3-4 mm long; glumes unequal, the upper one only just shorter than the floret, acuminate; palea barely shorter than the lemma.

Dry pine woods. -Far East. Indicated by V. L. Komarov and E. N. Klobukova - Alisova in their key to plants of the Far East country. Gen. Distr.: Jap. -Chin. Described from surroundings of Tokyo. Type in Copenhagen.

8. *K. sclerophylla* P. Smirn. in Fedde, Repert. spec. nov. XXX (1932) 399-400.

Perennial. Tufts compact, large; culms 40-60 cm tall, hard, glabrous, minutely puberulent only below the panicle; the lower old sheaths, covering the bases of shoots, oblong, brown, entire; leaves of sterile shoots flat or folded only below; sheaths of culm leaves glabrous. Panicle contracted, cylindrical, slightly divided in lower part, ca. 1 cm broad, pale; spikelets 6-7 (-9) mm long, short-pedicelated; glumes unequal, glabrous or [sic] acuminate, the upper somewhat shorter than the florets; lemmas acuminate or awn-pointed, lanceolate, sparsely hairy on the outside. (Plate XXV, Figure 5).

Stony places. -European part: Volg. -Don (Zhiguli), Zavolz. Endemic. Described from Zhiguli. Type in Moscow.

9. *K. Thoni* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 139.

Perennial. Tufts fairly compact or fairly loose; culms to 60 cm tall, stout, glabrous or only below panicle puberulent; the lower old sheaths pale, oblong, entire, rarely split; leaves of sterile shoots glabrous, flat or involute. Panicles oblong-pyramidal, to 2 cm broad, lobed, pale-colored; spikelets 6-8 mm long, 3-4-flowered; glumes unequal, 1/3-1/5 shorter than the florets, glabrous, acute; lemmas narrowly lanceolate, glabrous, finely acuminate. July.

River sands. -East. Siberia: Ang. -Sayan. Endemic. Described from surroundings of Minusinsk. Type in Leningrad.

10. *K. caucasica* Trin. ex Domin, Monogr. in Bibl. Bot. H. 65 (1907) 161; Trin. ex Steudel Nomencl. ed. II, 1 (1840) 848 nomen nudum.

Perennial. Tufts rather compact; culms 25-60 cm tall, puberulent in upper part or all over; old lower sheaths entire or more often unevenly split; leaves of sterile shoots green or glaucous, flat or involute, pilose or short-pubescent, rarely glabrous, mostly attaining half the length of the culm, or shorter; sheaths of culm leaves puberulent. Panicles spike-like, compact or cylindrical, fairly loose, 2-8 cm long and 6-13 mm broad; pedicels compact or of medium length; spikelets 4.5-6 mm long, 2-3 flowered, more or less motley-purplish; glumes and lemmas acuminate. June-July. (Plate XXV, Figure 6).

328 Alpine and subalpine meadows. -Europ. part: Volg. -Kam. (south, Ural-Mount Iremel); Caucasus: all regions exc. Tal.; West. Siberia: Alt.; Centr. Asia: Tyan'-Shan. (Sarydzhaz). Gen. Distr.: Arm. -Kurd., Mong. Described from Caucasus. Type in Berlin.

NOTE. This species is treated here according to Domin's conception. It varies greatly in a number of characters. Altai specimens of this species are separated by P. N. Krylov in the Flora of Western Siberia as a distinct species - *K. altaica* (Domin) Kryl. Lack of sufficient material precludes at present the breaking up of this species into a number of geographical races.

11. *K. Albovii* Domin, in Mag. Bot. Lap. III (1904) 344.

Perennial. Tufts rather loose, with numerous culms; the lower old sheaths narrow, entire, pale; culms slender, ca. 30 cm tall, coated with short white hairs all over or in upper part; leaves of sterile shoots mostly involute, rarely flat, narrow, long-ciliate on the margin, somewhat glaucous. Panicles oblong, lobed below, rather loose; spikelets short-pedicelled, 5-5.5 mm long, 2-3-flowered; glumes acuminate, glabrous, broader than the lemmas and paleas, markedly shorter than the florets; lemmas acuminate, often subulate-acuminate, lanceolate; palea shorter than the lemma. May-June.

Alpine meadows. -Caucasus: West. Transcauc. Endemic. Described from Adzharo-Imeretinsk Mountains. Type in Budapest.

12. *K. Ledebouri* Domin, Monogr. in Bibl. Bot. H 65 (1907) 164; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 264. -Ic.: Domin l.c., tab. XV, fig. 2.

Perennial. Tufts compact; culms ca. 35 cm tall, pubescent all over or along 7-8 cm below the panicle, ca. 1 mm in diameter; lower sheaths pale-colored; leaves of sterile shoots folded in their lower part, flat above, to 1.8 mm broad, green, strongly scabrous, hispid; sheaths of lower culm leaves pubescent. Panicles cylindrical, shiny, 4.5-5 cm long and 1-1.4 cm

broad; spikelets 7 mm long; glumes slightly shorter than the florets, oval-oblong, acute; lemmas subulate-acuminate, oval-oblong; palea nearly as long as the lemma. July.

Mountain slopes. -West. Siberia: Alt. Also recorded for East. Sib.: Ang. -Sayan. Endemic. Described from surroundings of Riddersk. Type in Leningrad.

13. *K. Buschiana* (Domin) Gontsch. comb. nova - *K. gracilis* var. *Buschiana* Domin in Compt. Rend. de l'Acad. des Sciences de l'URSS (1929) 141.

Perennial. Tufts not compact; culms 30-40 cm tall, profusely pubescent below the panicle, sparsely puberulent or glabrescent below, slender, mostly bearing 2 leaves below its middle; the lower old sheaths few in
329 number, entire or slightly torn, light brown, glabrous; Leaves of sterile shoots glabrous, 6-10 cm long, flat, 1.2-1.5 mm broad, thin, bright green, scaberulous on the margin; sheaths of culm leaves glabrous. Panicle oblong-oval, 2.5-3.5 cm long and to 1 cm broad; spikelets short-pedicel, obovoid, glabrous, 5 mm long; glumes shorter than the florets, somewhat unequal, obtuse; lemmas finely acuminate, with a narrow scarious margin; palea slightly shorter than the lamina. August.

Subalpine meadows. -Caucasus: Ciscauc. Endemic. Described from Digoriya, (Mount Tagors, 2,600 m). Type in Leningrad.

14. *K. Fominii* Domin in Monit. Jard. Bot. de Tiflis, livr. 16 (1910) 9.

Perennial. Tufts rather loose, with few culms; the lower old sheaths pale, often rather split; culms rather stout, 25-35 cm tall, mostly somewhat geniculate at base, villous all over; culm leaves with long sheaths and blades 2.5-3 mm broad, glabrescent on the upper surface, hispid underneath. Panicles oblong-cylindrical, 5-5.5 cm long and 1.5 cm broad, compact, sparingly lobed below, intensely brown-purple-tinged; spikelets subsessile, ca. 6 mm long, 3-flowered; glumes acuminate, unequal, hispid, shorter than the florets; lemmas long-acuminate or awn-pointed, rather hispid. July. (Plate XXV, Figure 7, a-b).

Subalpine meadows. -Caucasus: West. and East. Transcauc.: Georgia (Tiflis), Azerbaijan (Ganzha). Endemic. Described from the Tskhara-Tskhara Mountains, near Borzhomi. Type in Tiflis.

15. *K. nitidula* Velen. Fl. Bulg. I (1891) 611; Domin, in Allg. Bot. Zeitschr. IX (1903) 44. -Ic.: Domin, Monogr. in Bibl. Bot. H. 65 (1907) tab. IX, fig. 3, 4.

Perennial. Tufts compact; culms 30-60 cm tall; the lower old sheaths entire or irregularly torn; leaves of sterile shoots greenish or glaucous, soft, flat, ca. 1 mm broad, often involute, smooth. Panicles loose, mostly oval-oblong, strongly lobed, broad, with slender, long branches; spikelets mostly 4-5 mm long, linear-lanceolate, 2-3-flowered. May-June. (Plate XXV, Figure 19).

Rocks and stony slopes. -Caucasus: West. and East. Transcauc. (Tiflis). Gen. Distr.: Balk. -As. Min. and Centr. Eur. (Bohemia). Described from Bulgaria. Type in Prague.

16. *K. poaeformis* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 171. -Ic.: Domin l.c., tab. X, fig. 6, 7.

Perennial. Tufts small; culms covered below with old brown entire or slightly torn sheaths, 15-21 cm tall; leaves of sterile shoots 3-8 cm long,

mostly involute, minutely puberulent, more rarely hispidulous, to 0.75 mm broad. Panicles oblong-cylindrical, spikelike, fairly loose, 1.5-2.5 cm
330 long and 5-6 mm broad; spikelets very short-pedicelated; glumes shorter than florets, unequal, oval, subobtusate; glumes and lemmas brownish-tawny; palea scarcely shorter than the lemma. July. (Plate XXV, Figure 8).

Steppes. -East, Siberia: Ang. -Sayan. Endemic. Described from former Irkutsk Uezd. Type in Leningrad.

17. *K. askoldensis* Roshev. in Fedde, Repert. spec. nov. XIII (1914) 84. -*T. askol'dov*.

Perennial. Tufts loose; culms 30-60 cm tall, glabrous, pubescent only along 4-10 cm below the panicle, more rarely also puberulent at the nodes lower down, mostly slightly geniculate; the lower old sheaths oblong, indurate, pale tawny-brown or light grayish-brown, not torn or only slightly split longitudinally, rather pubescent; leaves of sterile shoots at most 1.5 mm broad, glabrous or hispidulous, somewhat scabrous, green, 13-25 cm long, with long, puberulent or ciliate sheaths. Panicles pale-colored, pyramidal or oblong-oval, strongly lobed, loose, 6-11 cm long and 1.5-3.5 cm broad at the broadest part; spikelets 4-5 mm long, 2-flowered. Glumes unequal, shorter than the florets; lemmas lanceolate, minutely scaberulous, thin-pointed; palea shorter than, more rarely as long as the lemma. July-August. (Plate XXV, Figure 18, a, b).

Wooded slopes, rocks. -Far East: Ussur. Coast of Tatarskii Strait (Svetlaya River), Askol'd and Russkii Islands. Gen. Distr.: Jap. -Chin. (Manchuria). Described from Askol'd Island. Type in Leningrad.

18. *K. gracilis* Pers. Synopsis I (1805) 97, s. ampl.: Domin, Monogr. in Bibl. Bot. H. 65 (1907) 176; Kryl. Fl. Zap. Sib. (Fl. west. Sib.) II, 264. -*Dactylis cristata* M.B. Fl. taur. -cauc. I (1808) 67 p. max. p. -*K. cristata* auct. p.p.: Ldb. Fl. Ross. IV, 401; Turcz. Fl. baic. -dah. II, 1, 338; Shmal'g. Fl. II, 619. -*lc.*: Domin, Monogr. tab. XII, fig. 1-5, tab. XIII, fig. 16, 2, 4-6, 8-11, 13-15, 17.

Perennial. Tufts compact; the lower old sheaths entire or rather split, pale or brownish-tawny; culms mostly 25-40, very rarely to 60 cm tall, quite glabrous or rather pubescent below the panicle, leafless above over much of its length; leaves of sterile shoots mostly narrow, involute or flat, short, rarely attaining 20 cm in length, glaucous or slightly so, smooth or scabrous, mostly puberulent, rarely glabrous; the lower culm sheaths mostly pubescent, more rarely glabrous. Panicles 1-10 cm long, mostly loose, lobed, more rarely compact, contracted, but in the latter instance with markedly longer lower branches, to 3.5 cm broad, pale-colored or purple-tinged; spikelets mostly narrowly lanceolate, 2-3 (rarely 4-5)-flowered, mostly glabrous; glumes and lemmas mostly lanceolate or narrowly lanceolate. May-August. (Plate XXV, Figure 9).

331 Steppes, steppe mountain slopes, steppe meadows, forest borders, pine woods, light oak woods. In the north mostly on sandy plots and over limestone. -European part: all regions except the larger part of Kar. -Lap. and Dv. -Pech. where it occurs only in the southern part; Caucasus: all regions; West. Siberia -except the northern and partly the central part of Ob.; East. Siberia -except greater part of Yenisei, where it occurs only in the southern part, and Len. -Kol. where it occurs in the southern and central parts; Far East: all regions; Centr. Asia: Dzung. -Tarb., Pam. -Al., Tyan'-Shan. Gen. Distr.: Europe, except Scandinavia (where it occurs

only in the area of Estonia, Latvia, and Lithuania), greater part of Iberian and Italian peninsulas, Balk. - As. Min. (except greater part of Balkan Peninsula), Arm. - Kurd., Iran (in the northeast); Ind. - Him. (in the north-east and north), Dzung. - Kashg., Mong., Jap. - Chin. (to the north of Yangtze Kiang) except Japan, North America. Described from Europe.

NOTE. This widely distributed species is treated here according to Domin's wide conception. It falls into a series of geographical races which require a detailed study.

19. *K. sibirica* Domin, Mongr. in Bibl. Bot. H. 65 (1907) 227 pro sp.

Perennial. Tufted; culms 15-35 cm tall, finely puberulent all over; leaves of sterile shoots thin, green, soft, smooth or scaberulous, mostly glabrous, more rarely ciliate, flat, to 1 mm broad, some involute. Panicles cylindrical in outline, slightly interrupted throughout their length, pale-colored, very short-branched, 4-7 cm long; spikelets sessile, lanceolate, long-acuminate or awn-pointed, covered with short hairs. (Plate XXV, Figure 10).

East. Siberia: Yenisei. Endemic. Described from the estuary of Nizhnaya Tunguzka River. Type in Leningrad.

20. *K. seminuda* (Trautv.) Domin, Monogr. in Bibl. Bot. H. 65 (1907) 227. - *K. cristata* var. *seminuda* Trautv. in A. H. P. V. 1 (1877) 138. - Ic.: Domin, Monogr. tab. XIII, fig. 18.

Perennial. Tufts compact, more rarely fairly loose; culms slender, 35-50 cm tall, subgeniculate-ascending, puberulent over a considerable length below the panicle; leaves of sterile shoots greenish, mostly involute, some flat but at most ca. 1 mm broad, soft-pilose or glabrous, scaberulous; sheaths of culm leaves pubescent. Panicle broadly cylindrical, slightly lobed, loose, somewhat interrupted, 4.5-6 cm long and more than 1 cm broad; spikelets ca. 6 mm long, 2-3-flowered, glumes subacute, glabrous, mostly colored; lemmas acuminate, colored, short-pubescent throughout; palea markedly shorter than the lemma. (Plate XXV, Figure 11).

Tundra. - Arctic: Arct. Siberia. Endemic. Described from Low. Len. Type in Leningrad.

332 21. *K. Luerssenii* Domin in Monit. Jard. Bot. de Tiflis, livr. 16 (1910) 14; Monogr. in Bibl. Bot. H. 65 (1907) 228. - Ic.: Domin l. c., tab. XII, fig. 6, tab. XIII, fig. 12.

Perennial. Tufts fairly loose, with few culms; culms slender, 50-80 cm tall, glabrous, leafless above over a considerable stretch (to 30 cm); the lower old sheaths oblong, brownish, mostly glabrous, entire, more rarely slightly split; leaves of sterile shoots narrow, 20-35 cm long and 1-1.5 mm broad, flat or involute, scabrous, glabrous or sparsely hirtellous. Panicles narrowly cylindrical, mostly contracted, hence rather compact, strongly interrupted below, 7-12 cm long, 6-9 mm broad; spikelets short-pedicelled or sessile, 5-6 mm long, 2-flowered; glumes lanceolate, acuminate, pale-colored or slightly purple-tinged, glabrous, scabrous on the back, unequal, markedly shorter than the florets; lemmas lanceolate, long-acuminate, mostly with a very short scabrous awn from the summit, glabrous or glabrescent; palea nearly as long as the lemma. May-June. (Plate XXV, Figure 12).

Needlegrass and needlegrass-fescue steppes, steppe slopes, more rarely steppe meadows. - Caucasus: Ciscauc. (Kuban', Stavropol'). Endemic. Described from Teberda. Type in Leningrad.

Series 3. *Monanthae* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 50. -Spikelets 1-flowered.

22. *K. monantha* Domin, Monogr. in Bibl. H. 65 (1907) 242. -Ic.: Domin l. c., tab. XVII, fig. 5.

Perennial. Tufts fairly loose; culms to 90 cm tall, pubescent along 10 cm or more, glabrous below; the lower old sheaths tawny, torn; sheaths of lower culm leaves hispid, blades green, flat, 2-4 mm broad, to 15 cm long, ciliate on the margin, glabrous elsewhere. Panicles oblong-cylindrical, 9-12 cm long, 1.5-2 cm broad, loose, somewhat lobed below, interrupted; spikelets long-pedicelled, ca. 5 mm long; glumes somewhat unequal, narrowly lanceolate, acuminate, scarious, green only on the back, the upper as long as the lemmas, the lower shorter; lemmas linear-lanceolate, acuminate, green; palea scarcely shorter than the lemma. June-July. (Plate XXV, Figure 13).

Caucasus; Ciscauc. Known only from Teberda, from where it is described. Type in Leningrad.

Subsection *Pseudoreoentes* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 50. -Plants loosely tufted, with thin, creeping rhizomes.

23. *K. polonica* Domin in Mag. Bot. Lap. III (1904) 186. -*K. grandis* Bess. ex Nym. Consp. (1882) 816 nomen nudum; Domin, Monogr. in Bibl. Bot. H. 65 (1907) 243. -Ic.: Domin, Monogr. tab. XVII, fig. 3.

Perennial. Tufts loose, with numerous culms; culms pubescent below panicle; sheaths of sterile shoots copiously soft-pubescent; leaves of sterile shoots green, long, 2-2.5 mm broad, mostly flat, soft-hairy or puberulent, ciliate on the margin; the lower sheaths of culm leaves copiously soft-pubescent with slightly recurved white hairs, the upper ones puberulent or glabrescent, ciliate on the margin. Panicles broad, 1-2 cm in diameter, interrupted below; glumes short-pedicelled, (5-) 6-7 mm long, 2-3 (rarely 4)-flowered; glumes lanceolate, acute, punctate, markedly unequal, shorter than the florets; lemmas acuminate or acute, punctate or puberulent; palea nearly as long as the lemma. May-July. (Plate XXV, Figure 14 a-c).

Sandy soils, mainly in pine woods, grass and lichen woods, outskirts of forests, rather overgrown river dunes, rare in broad-leaved forests. - European part: Dv. -Pech. (along the river Pinega), Lad. -II'm. (in west. part), Upp. Volg. (except the east), Upp. Dnep., Mid. Dnep., (in north-east. part), Gen. Distr.: Scand. (Latvia, Lithuania, Estonia), Centr. Eur. (Poland). Described from Poland. Type in Budapest.

24. *K. asiatica* Domin in Bull. Herb. Boiss., 2 ser. V (1905) 947; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 262 -*K. hirsuta* Ldb. Fl. Ross. IV (1853) 402. -Ic.: Domin, Monogr. in Bibl. Bot. H. 65 (1907) 250, Ic.: l. c., tab. XVI, fig. 1, 2.

Perennial. Tufts loose, with creeping, mostly branched, thin rhizomes. Culms 5-18 (-20) cm tall, pubescent all over or along considerable stretch in upper part; upper sheaths pilose-pubescent, somewhat inflated; the lower old sheaths linear-oblong, entire; leaves of sterile shoots 4-9 (-10) cm long, glabrous or glabrescent, involute or not infrequently flat. Panicles compact, spikelike, cylindrical or oblong-oval, 1-4 cm long, 7-12 mm broad, purple-tinged; glumes lanceolate, somewhat unequal, acute, shorter than the florets; lemmas awn-pointed, broadly lanceolate; palea scarcely shorter than the lemma. July-August. (Plate XXV, Figure 15 a, b).

PLATE XXV



336 Dry precipitous slopes, stony and sandy places, and relatively dry sections of the tundra. - Arctic: Arct. Eur., Arct. Siberia., Nov. Zem., East. Siberia: Len. - Kol. (surroundings of Verkhnekolymsk, Adzhergai in the Lena River valley). Endemic. Described from Taimyr. Type in Leningrad.

25. *K. atrovioacea* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 252; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 263. - Ic.: Domin, l. c., tab. XV, fig. 3, 4.

Perennial. Tufts loose. Culms 15-25 cm tall, puberulent; leaves of sterile shoots reaching the middle of the culms or above it, green, soft, glabrous or sparsely hirsute, mostly flat, 1-1.5 mm broad; sheaths of culm leaves short-pubescent. Panicles spike-like-oblong, more rarely subpyramidal-oblong (slightly broad), fairly compact, purple-tinged. Spikelets very short-pedicel or subsessile, 4-5 mm long, 2-, more rarely 3-flowered; glumes markedly shorter than the florets, somewhat unequal, oval-lanceolate, very often acuminate; lemmas oval-lanceolate, awn-pointed; palea slightly shorter than the lemma. June-July.

Alpine meadows, moss-lichen mountainous tundras, and stony mountain slopes. - West Siberia: Alt.; East. Siberia: Ang. - Sayan. (Sayany). Endemic. Described from Sayany (Aspanskii Crest). Type in Leningrad.

26. *K. geniculata* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 353. - Ic.: Domin, l. c. tab. XV, fig. 5, tab. XVIII, fig. 4.

Perennial. Tufts loose, with thin, branching rhizomes. Culms very slender, weak, geniculate at all the nodes, 40-50 cm tall, pubescent all over or only below the panicle; leaves of sterile shoots soft, scaberrulous on the margin, green, ca. 1 mm broad, glabrescent, sparsely ciliate on the margin. Panicles oblong-cylindrical or subpyramidal-oblong, fairly loose, 3.5-5.5 cm long, to 1.5 cm broad below, intensely purple. Spikelets 5-5.5 mm long, 2-3-flowered; glumes markedly unequal, lanceolate, acute, shorter than the spikelets; lemmas glabrous, acute; palea markedly shorter than the lemma. July. (Plate XXV, Figure 16).

Mountain slopes in forests, near bare Siberian hills. - East, Siberia: Ang. - Sayan. Described from surroundings of Tunkinsk. Type in Leningrad.

27. *K. incerta* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 250.

Perennial. Tufts loose or fairly loose, with thin, short, creeping rhizomes. Culms slender, quite glabrous, leafy almost to the top; leaves of sterile shoots involute or often flat, less than 1 mm broad, glabrous,

Explanation to Plate XXV

1-*Koeleria Pohlana* (Domin) Gotsch., a) spikelet, b) panicle; 2-*K. glauca* DC., a) spikelet, b) panicle, c) lower part of plant with sterile shoot; 3-*K. Degeni* Domin, a) spikelet, b) panicle, c) lower part of plant; 4-*K. Litwinowi* Domin, spikelet; 5-*K. sclerophylla* P. Smirn., spikelet; 6-*K. caucasica* Trin., spikelet; 7-*K. Fominii* Domin, a) spikelet, b) panicle; 8-*K. poraeformis* Domin, spikelet; 9-*K. gracilis* Pers., spikelet; 10-*K. sibirica* Domin, spikelet; 11-*K. seminuda* Trautv. Domin, spikelet; 12-*K. Luerssenii* Domin, spikelet; 13-*K. monantha* Domin, spikelet; 14-*K. polonica* Domin, a) spikelet, b) panicle, c) lower part of plant with pubescent sheath; 15-*K. asiatica* Domin, a) spikelet, b) panicle; 16-*K. geniculata* Domin, spikelet; 17-*K. Delavignei* Domin, a) spikelet, b) panicle; 18-*K. askoldensis* Roshev., a) spikelet, b) panicle; 19-*K. nitidula* Velen., spikelet; 20-*Lopochloa obtusiflora* (Roem.) Gotsch., spikelet; 21-*L. phaeoides* (Vill.) Rehb., spikelet.

somewhat glaucous; upper culm leaves mostly reaching the panicle. Panicles broad, narrowly oblong-cylindrical, loose, interrupted below, purplish variegated, Spikelets linear-lanceolate, ca. 4 mm long; glumes narrowly lanceolate, subobtusate, the upper as long as the florets or slightly shorter. May-June.

- 337 Steppes. - European part: Zavolzh. Known only from the former Chistopol'skii Uezd of Kazan Guberniya, and thence described. Type lost.

28. *K. barabensis* Domin, Monogr. in Bibl. Bot. H. 65 (1907) 249.

Perennial. Tufts loose, with numerous culms; rhizomes thin, creeping; culms very slender; glabrous, leafy all the way up. Leaves of sterile shoots attaining $1/3-1/5$ the length of the culm, rather indurate, glaucous, very narrow, mostly involute, with puberulent sheaths; uppermost culm leaf reaching the panicle. Panicles oblong, compact, pale yellowish, 4-5 cm long and 10-12 mm broad; spikelets 3.4-4 mm long, 2-7-flowered; glumes subobtusate, the upper nearly as long as the florets. May-July.

Steppes. - West. Siberia: Irt. Endemic. Described from Baraba. Type lost.

29. *K. Delavignei* Czern. Consp. plant. Ucrain. 1859 (nom.); Domin, Monogr. in Bibl. Bot. H. 65 (1907) 247; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 269. - Ic.: Domin l. c. tab. XVII, fig. 2.

Perennial. Tufts loose, small, with 2-3 culms; rhizomes short or long, thin, creeping. Culms slender, to 80 cm tall, slightly geniculate, glabrous or pubescent only below the panicle; leaves of sterile shoots 10-35 cm long, flat, 0.75 mm broad, or involute, mostly green, soft; the lower sheaths glabrous, those of the culm without cilia on the margin. Panicles oblong-cylindrical or oblong, 6-9 cm long, more than 1 cm broad, loose, lobed, slightly purple-tinged, shining, mostly interrupted below; spikelets 3.5-4.5 mm long, 2- more rarely 3-flowered; glumes somewhat unequal, subobtusate, scarcely shorter than the florets; lemmas lanceolate, glabrous or puberulent; palea nearly as long as the lemma. June-July. (Plate XXV, Figure 17 a, b).

Flood meadows, more rarely depressions in steppes, oak forests, very rarely pine woods. - European part: Upp. Volg., Volg. - Kam. (in central and southern parts), Upp. Dnep., Mid. Dnep., Volg. - Don., Zavolzh., Low. Don., in north. part; West. Siberia: Upp. Tob. (in the north), Ob. region (in the south), Irt. (in the north and northeast; known more to the south from the surroundings of Kankrinskii, Akmolinskii Raion); East. Siberia: Ang. - Sayan.; Minusinskii Raion, Nozhnii Island in Yenisei River (most easterly occurrence of this species). Endemic. Described from Ukraine. Type lost, cotype in Khar'kov.

Genus 154. LOPHOCHLOA* RCHB.**

Rchb. Fl. Germ. excurs. (1830) 42.

Inflorescence a mostly compact, cylindrical panicle, sometimes slightly lobed below. Spikelets mostly 5-flowered, strongly laterally compressed. Glumes keeled, both acuminate or the upper one subobtusely, unequal, the lower narrower and shorter than the upper which resembles the lemmas.

- 338 Lemmas herbaceous, keeled, narrowly scarious-fringed on the margin, somewhat longer than the glumes, with 3 or 2 prominent nerves, broadly lanceolate to oval-lanceolate, awnless or awned. Palea shorter than the lemma, scarious, 2-3-toothed. Anthers small, 0.3-1 mm long. Caryopsis oblong, flattened, slightly convex on dorsal and on ventral side. Annual grasses.

- 1 Lemmas and upper glumes obtuse 2. *L. obtusiflora* (Boiss.) Gontsch.
+ Lemmas and upper glumes acuminate 1. *L. phleoides* (Vill.) Rchb.

1. *L. phleoides* (Vill.) Rchb. Fl. Germ. excurs. (1830) 42. - *Festuca phleoides* Vill. Fl. Delph. (ed. J. E. Gilibert) (1785) 7. - *Brachypodium phleoides* P. B. Agrost. (1812) 155. - *Bromus phleoides* Gmel. Syst. (1791) 190. - *Rostraria pubescens* Trin. Fund. (1820) 150. - *Koeleria phleoides* Pers. Syn. 1 (1805) 97; Griseb. in. Ldb. Fl. Ross. IV, 403; Shmal'g. Fl. II, 630; Domin, Monogr. in Bibl. Bot. H. 65, 256. - Ic.: Domin, l. c. tab. XVIII, fig. i., tab. XIX, fig. 1.

Annual. Culms 1-6, erect, 7-50 cm tall, glabrous, leafy nearly to the top; leaves green, flat, soft, more or less hirsute-ciliate; sheaths, especially the lower ones, hirsute. Panicles mostly compact, cylindrical or more or less lobed in lower part (rarely above), 2-10 cm long. Spikelets strongly laterally compressed, short-pedicel, mostly 5-flowered, 3-4.5 mm long; glumes markedly unequal, acuminate, glabrous, often hispid; lemmas acuminate, glabrous or hispid, prominently nerved, awnless or often awned from the back below the summit; awn straight, scabrous, very short or as long as the lemma. Palea sharply 2-3-toothed, always shorter than the lemma. Anthers oval or round-oval, 0.4-0.6 mm long. April-June (July). (Plate XXV, Figure 21).

Sandy plots, banks, afforested foothills, and slopes of low mountains. - European part: Crimea; Caucasus: all regions; Centr. Asia: Upp. Turkm., Pam. - Al., Syr-Dar. (southwest. part). Gen. Distr.: Atl. Eur., Medit., Balk. - As. Min., Iran, Arm. - Kurd. Described from southern France. Type in Zurich.

2. *L. obtusiflora* (Boiss.) Gontsch. comb. nova. - *Koeleria obtusiflora* Boiss. Diagn. ser. 1, VII (1846) 121; Domin, Monogr. in Bibl. Bot. H. 65, 272. - Ic.: Domin, l. c. tab. XVIII, fig. 8.

* From Greek *lophos* - comb, and *chlos* - grass.

** Compiled by N. F. Gontcharov.

Annual. Culms glabrous, leafy nearly to the top; leaves flat, green, narrow, rather sparsely hirsute. Panicles compact, cylindrical or slightly lobed in lower part. Spikelets ca. 2 mm long; glumes markedly unequal, the lower narrow, acuminate, short, the upper subobtusely, much broader and longer; palea distinctly shorter than the lemma. May-June. (Plate XXV, Figure 20).

- 339 Foothills. - Centr. Asia: Pam. - Al. (mainly in southern part). Gen. Distr.: West, Medit., East. Medit. Balk. - As. Min., Arm. - Kurd., Iran. Described from Persia (Shiraz). Type in Geneva.

Genus 155. SPHENOPUS* TRIN.

Trin. Fund. Agrost. (1820) 135.

Inflorescence an open panicle with small spikelets. Spikelets 2-3-flowered, laterally compressed, with jointed rachilla. Glumes unequal, hyaline, persistent. Lemmas membranaceous, obtuse, the lower 3-nerved, keeled, the upper notched at the summit, with 2 scabrous keels. Lodicules 2, rather succulent, bifid. Stamens 3. Pistils 2, with short-plumose stigmas. Caryopsis oblong, naked, free. Annual plants.

1. *S. divaricatus* (Gouan) Rchb. Fl. Germ. excurs. (1830) 45; Griseb. in Ldb., Fl. Ross. IV, 383; Boiss. Fl. Or. V, 575; Grossg. Fl. Kavk. (Fl. Cauc.) I, 98. - *Poa divaricata* Gouan, III (1773) 4; M. B. Fl. taur.-cauc. III. (1819) 66. - *Sphenopus Gouanii* Trin. Fund. Agrost. (1820) 135. - *Festuca Sphenopus* C. A. Mey. Verz. (1831) 22. - *Nephelochloa breviglumis* Trautv. in A. H. P. VII (1880) 523. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 81, fig. 1616. - Exs.: Herb. Fl. Cauc. No 55; Fl. cauc. exs. No 101 (sub *Festuca expansa* (Gmel.) Kunth).

Annual. Roots thin, fibrous; culms 5-15 cm tall, branching at the base, geniculate-ascending, slender, smooth; leaf sheaths shorter than the internodes, smooth; leaves narrowly linear, folded, smooth; ligule 6 mm long, pointed. Panicle open, with filiform, smooth branches; spikelets small, 2-2.5 mm long, 3-7-flowered, ovate-lanceolate, on long, club-shaped pedicels; lower glume ca. 1 mm long, half as long as the upper, hyaline, obtuse; lemma with a prominently scabrous keel, obtuse, hyaline at the summit. April-May. (Plate XXVII, Figure 1, a).

Sands and solonchaks. - Caucasus; Dag., East. Transcauc.; Centr. Asia: Kara-Kum., Upp. Turkm. Gen. Distr.: Medit., Balk. - As. Min., Arm. - Kurd., Iran. Described from southern Europe. Type in London.

Genus 156. CUTANDIA** WILLK.

Willk. in Bot. Zeitg. XVIII (1860) 130.

Inflorescence a rather dense panicle, with short branches bearing a small number of spikelets. Spikelets many-flowered, narrow, with jointed

* From Greek *sphen* - club, and *pus* - leg.

** Named for Vicente Cutanda (1804-1865), professor of botany in Madrid, author of Flora of Madrid.

340 rachilla, glabrous, florets perfect. Glumes narrow, unequal, 1-3-nerved, acuminate, shorter than the spikelets. Lemmas prominently 3-nerved, keeled, entire or bidentate at the summit, awnless or with a rather short awn. Palea narrow, 2-nerved. Stamens 3. Pistils short, with plumose stigmas. Caryopsis oblong, flattened from the back, free. Annual plants with numerous culms and always narrow leaves.

1. *C. memphitica* (Spreng.) Richt. Pl. eur. I (1880) 77. - *Dactylis memphitica* Spreng. Hort. Hal. add. I (1799) 20. - *Festuca memphitica* Boiss. et Coss. Pl. crit. (1841-51) 183. - *Scleropoa caspica* C. Koch. in Linn. XXI (1848) 409. - *Scleropoa memphitica* Boiss. Diagn. pl. or. ser. 1, XIII (1853) 62; Griseb. in Ldb. Fl. Ross. IV, 348. - Exs.: Herb. Fl. cauc. No 108; Sintenis Iter transc.-pers. No 326.

Annual. Roots thin, fibrous; culms 5-30 cm tall, branching at the base, often geniculate-ascending, glabrous, smooth; leaves narrowly linear, rather flat, glabrous; ligule elongate, to 3 mm long. Panicle open, with brittle, jointed, divergent branches; spikelets narrow, oblong-linear, 2-3-flowered, borne on rather short, ribbed pedicels; glumes lanceolate, acuminate, keeled, the lower shorter than the upper; lemma lanceolate, acuminate, 3-nerved, keeled, with a slender awn from the summit. April-May. (Plate XXVII, Figure 2, a).

Sands. - Caucasus: Dag., East. Transcauc.; Centr. Asia: Kyz.-Kum., Upp. Turkmen. Gen. Distr.: Medit. (west. and southeast Spain, North Africa, Syria, Palestine), Iran. Described from North Africa.

ECONOMIC IMPORTANCE. A good pasture plant, especially for sheep.

Genus 157. MELICA* L.**

L. Gen. Pl. ed. I (1737) 335, ed. 5 (1754) 31.

Inflorescence a cylindrical panicle, occasionally contracted. Spikelets many-flowered, terminating in a lump consisting of reduced and sterile florets. Glumes convex, shorter or as long as the florets. Lemma convex, coriaceous at the base, hyaline above, many-nerved (nerves sometimes obscure). Perennials.

1. Lemma pilose all over or on the margins (section *Beckeria* Aschers.) 2.
- + Lemma glabrous (section *Eumelica* Aschers.) 14.
2. The lump of sterile florets [rudiment] clothed with hairs. Spikelets large, 10-15 mm long 1. *M. penicillaris* Boiss. et Bal.
- + Rudiment naked. Spikelets usually smaller 3.
3. Lemma densely clothed with hairs all over or on the margins 4.
- + Lemma sparsely hairy 13.
4. Lemma clothed with hairs all over its surface (series *Cupanianae*) 5.
- + Lemma with hairs only on the margin (series *Ciliatae*) 10.

* Name for a kind of sorghum, recorded by Caesalpinus.

** Compiled by E. M. Lavrenko.

- 341 5. Lower glume $1/4-1/3$ (rarely $1/2$) as long as the upper. Spikelets (7) 8-10 mm long 6.
 + Lower glume $2/3$ (or slightly more) as long as the upper. Spikelets 6-7 (8) mm long 8.
 6. Culms as well as the sheaths and both surfaces of blades of all leaves densely clothed with soft hairs 2. *M. persica* Kunth.
 + Culms glabrous. Sheaths glabrous, or only those of the lower leaves clothed with soft hairs; leaf blades glabrous underneath, woolly-pubescent or glabrous on the upper surface 7.
 7. Sheaths of lower leaves clothed with soft hairs; sheaths of upper leaves glabrous 3. *M. atropatana* B. Schischk.
 + Sheaths of all leaves glabrous 4. *M. inaequiglumis* Boiss.
 8. Culm, sheaths and blades (both sides) of all leaves pubescent or soft hairy 5. *M. canescens* (Rgl.) E. Lavrenko
 + Culms glabrous. Sheaths glabrous or only those of lower leaves clothed with soft hairs; blades glabrous underneath, pubescent or glabrous on the upper side 9.
 9. Sheaths of lower leaves clothed with soft hairs; sheaths of upper leaves glabrous 6. *M. Hohenackeri* Boiss.
 + Sheaths of all leaves glabrous 7. *M. breviflora* Boiss.
 10. Lower glume $1/3$ shorter than the upper. Panicle always very dense, equal-sided, fairly broad, 10-15 mm across 8. *M. transsilvanica* Schur.
 + Lower glume $1/4$ shorter or nearly as long as the upper. Panicle relatively loose, sometimes few-flowered, rather lopsided (in fruit sometimes almost equal-sided), narrower, (5) 8-12 mm across 11.
 11. Upper glume abruptly pointed or micronate. Spikelets small, 4-6 mm long 11. *M. taurica* C. Koch.
 + Upper glume gradually acuminate. Spikelets (5) 6-7 mm long 12.
 12. Glumes brownish-purple or pale brown 9. *M. glauca* F. Schultz.
 + Spikelets golden or pale golden from the beginning 10. *M. flavescens* (Schur) Simonkai.
 13. Spikelets ca. 9-15 mm long. Glumes about equal in length, reddish-brown, exceeding half the length of spikelet 13. *M. Turczaninowiana* Ohwi.
 + Spikelets 4-5 mm long. Glumes unequal in length, pale, attaining half the length of spikelet 12. *M. virgata* Turcz.
 342 14. Panicle many-flowered, cylindrical, 10-25 cm long. Spikelets ca. 10 mm long 14. *M. altissima* L.
 + Panicle few-flowered, loose, less than 10 cm long. Spikelets 5-8 mm long 15.
 15. Spikelets containing a single fertile floret, erect 15. *M. uniflora* Retz.
 + Spikelets containing two fertile florets, usually drooping 16.
 16. Lemmas prominently nerved. Plants with creeping rhizomes 16. *M. nutans* L.
 + Nerves of lemmas not prominent. Plants tufted 17.
 17. Glumes broadly hyaline, shining, whitish or somewhat purplish at the base (mountains of Central Asia) 19. *M. secudna* Rgl.
 + Glumes greenish, reddish-purple or dark purple; scarious only at the margin 18.

18. Glumes greenish, somewhat reddish-purple only near the scarious margin, more rarely reddish-purple all over the back. Ligule elongate, to 2.5 mm long (forest-steppes of the European part of the Union, Caucasus). 17. *M. picta* C. Koch.
 + Glumes dark purple, with a wide white fringe. Ligule very short, often obsolete (mountains of Caucasus). 18. *M. minor* Hack.

Section 1. *Beckeria* (Bernh.) Aschers. Fl. Prov. Brand. I (1864) 838 (as section) Bernh. Syst. Verz. Pfl. Efr. (1800) 20, 40 (as genus) -Spikelets (at the time of flowering and fruiting) spreading. Lemmas rather densely hairy on the back.

1. *M. penicillaris* Boiss. et Bal. Diagn. ser. 2, IV (1859) 132; Boiss. Fl. Or. V (1884) 591. -Exs.: Bourg. Pl. Lyciae (1860) No 282.

Perennial. Rhizome short; culms 60-70 cm tall, compact; leaves glabrous, their blades stiff, often involute; blades and sheaths scabrous; ligule white, subobtusate, 2-4 mm long. Panicle loose, few-flowered, 1-sided, elongate, to 25 cm long; inflorescence branches bearing 1-5 spikelets each; pedicels short, puberulent below spikelet; spikelets large, 10-12 (15) mm long, containing 2 fertile florets; rudiment clothed with hairs; glumes pale purple or light yellowish, the larger one nearly as long as the spikelet, broadly oblong, obtuse; lemma oblong, obtuse, densely clothed with long yellowish hairs. June.

Rocks. -Caucasus: South. Transcauc. (along Araks). Gen. Distr. East. Medit., Arm.-Kurd. Described from As. Minor. Type in Geneva.

- 343 Series 1. *Cupaniana* E. Lavrenko. -*M. Cupani* Boiss. Fl. Or. V (1884) 590 non Guss. (species 2-7). Tufted plants. Panicle cylindrical, the short branches appressed to axis; spikelets short-pedicel, erect or nodding; the terminal sterile floret naked; lower glume shorter than the upper; lemma clothed all over with long, whitish or somewhat yellowish hairs.

A Mediterranean group or species, amply represented in this country in Transcaucasia and in Central Asia.

2. *M. persica* Kunth, Gram. (1835) 351. -*M. vestita* Boiss. Diagn. ser. 1, VII (1846) 125. -*M. Cupani vestita* Boiss. Fl. Or. V (1884) 591. -*M. pannosa* Boiss. Diagn. ser. 1, XIII (1853) 55. -*M. Cupani* ? *pannosa* Boiss. Fl. Or. V (1884) 591. -Ic.: Kunth, Gram. (1835) pl. 89.

Perennial. Culms 15-50 (-75) cm tall, rather copiously clothed with short and soft or scabrous hairs; leaves (sheaths and both sides of blades) densely clothed with soft reflexed hairs (rarely leaves short- and rough-pubescent); ligule very short, occasionally to 2.5 mm long on upper leaves. Panicle loose, almost 1-sided, or dense, to 15 cm long; spikelets 8-10 mm long; glumes oblong-lanceolate, acute, pale or rather purplish; lower glume 1/3 as long as the upper. May.

Stony mountain slopes. -Centr. Asia: Kara-Kum. (Krasnovodsk), Upp. Turkm. (often). Gen. Distr.: Arm.-Kurd., Iran. Described from Persia between Kermakhan and Amadan). Type in Berlin.

3. *M. atropatana* B. Schischk. in Bull. Museum de Georgie I (1922) 1; Grossg. Fl. Kavk. (Fl. Cauc.) I, 100. -Ic. B. Schischk. l.c., tab. I.

Perennial. Culms 20-40 cm tall, erect or ascending, glabrous, scabrous above; lower leaf sheaths soft-hairy, the upper ones glabrous, scabrous; leaf blades glabrous and scabrous underneath, pubescent-woolly on the upper surface; ligule short, lacerate. Panicle erect, elongate, almost

1-sided, few-flowered; spikelets 8-10 mm long; glumes lanceolate, pale or purple, the lower 1/3 as long as the upper. May.

Dry stony places. -Caucasus: South. Transcauc.: Centr. Asia: Upp. Turkm. (Chuli, mountains). -Gen. Distr.: Arm.-Kurd. Described from Nakhichevan Republic, between Ordubad and Akulis. Type in Tiflis; cotype in Leningrad.

4. *M. inaequiglumis* Boiss. Diagn. ser. 1, VII (1846) 124. -M. Cupani *inaequiglumis* Boiss. Fl. Or. V (1884) 509. -Exs.: Kotschy, Pl. Pers. austr. (Ed. Hohenacker, 1845) No 315.

344 Perennial Culms 20-60 cm tall, stout, glabrous, rather scabrous; leaf sheaths glabrous; blades stiff, reflexed, glabrous and scabrous underneath, on upper surface short-pubescent or glabrous and scabrous due to short bristles (var. *turcomanica* E. Lavrenko); ligules obtuse, to 1 mm, rarely to 2.5 mm long. Panicle almost 1-sided, fairly dense, rarely loose and few-flowered, 4-12 cm long; spikelets erect or nodding (7) 8-10 mm long; glumes lanceolate, acute, mostly pale, rarely purplish, the lower 1/3 (rarely 1/2) as long as the upper. May. (Plate XXVI, Figure 11).

Dry stony slopes in the mountains. -Caucasus: South. Transcauc. (Nakh-respublika); Centr. Asia: Upp. Turkm. (often); only var. *turcomanica*; Syr-Dar.; Pam.-Al. (often); Tyan'-Shan (Karatau). Gen. Distr.: Arm.-Kurd., Iran. Described from southern Persia, Shiraz. Type in Geneva.

5. *M. canescens* (Rgl.) E. Lavrenko, nova spec. in Addenda p. 752. -M. Cupani Guss. *canescens* Rgl. in A. H. P. VII (1880) 627.

Perennial. Culms 15-45 cm tall, erect or ascending at the base, fairly slender, glabrous or scabrous pubescent above; leaf sheaths and blades densely clothed with fairly long, soft hairs; blades involute, rarely rather flat; ligule to 2.5 mm long, ciliate. Panicle rather 1-sided, contracted, rather dense, rarely few-flowered, 3 1/2-6 (13 1/2) cm long; spikelets nodding, 6-7 (8) mm long; glumes lanceolate, acute, more or less purple, rarely pale; the lower glume 2/3, rarely 1/2 as long as the upper. May-July. (Plate XXVI, Figure 1).

Stony slopes in the mountains. -Centr. Asia: Pam.-Al. (often). Gen. Distr.: Iran. Described from Centr. Asia-Basmandinsk. Type in Leningrad.

6. *M. Hohenackeri* Boiss. ser. 1, XIII (1853) 54. -M. Cupani & Hohenackeri Boiss. Fl. Or. V (1884) 590. -M. *persica* β *caspica* Griseb. in Ldb. Fl. Ross. IV (1853) 398.

Perennial. Culms 30-60 cm tall, erect or ascending at the base, glabrous, smooth; sheaths of lower leaves clothed with dense, soft, recurved hairs; those of upper leaves glabrous; leaf blades involute, scabrous-pubescent on the upper surface, glabrous underneath; ligule to 2.5 mm long. Panicle rather loose, rarely somewhat dense, 1-sided, to 20 cm long; spikelets nodding, 6-7 (8) mm long; glumes more or less purple, rarely pale, broadly lanceolate, acute, the lower 3/4-2/3 as long as the upper. May-June.

Dry, stony mountain slopes. -Caucasus: East. Transcauc. (Karabakh), Tal.; Centr. Asia: Upp. Turkm. (often). Endemic. Described from Tal.-Type in Geneva.

7. *M. breviflora* Boiss. Diagn. ser. 1, VII (1846) 124. -M. Cupani & *typica* Rgl. et β *turkestanica* Rgl. in A. H. P. VII (1880) 627. -M. Cupani *breviflora* Boiss. Fl. Or. V (1884) 590. -M. Cupani

var. *darwasica* Roshev. in herb. Leningrad. -Ic.: in Jacq. Voy., tab. 175 (sub *M. Jacquemontii* Decaisn.). -Exs.: Kotschy, Pl. Pers. austr. (1845) No 754.

- 345 Perennial. Culms (10) 30-60 cm tall, erect or slightly ascending at the base, slender, glabrous; leaf sheaths glabrous, blades glabrous or often pubescent on the upper surface, setaceous-involute, rarely flat; ligule elongate, to 2.5 mm long, cleft. Panicle rather 1-sided, contracted, few-flowered or fairly dense, 5-12 cm long; spikelets nodding, 6-7 (8) mm long; glumes lanceolate, acute, more or less purple, rarely pale; lower glume 2/3, rarely 1/2, as long as the upper. June-August. (Plate XXVI, Figure 10).

Stony places in mountains. -Caucasus: Dag., South. Transcauc.; Centr. Asia: Upp. Turkm. (often), Syr-Dar., Pam.-Al. (often), Tyan'-Shan (Ketmen Crest). Gen. Distr.: Arm.-Kurd., Iran. Described from southern Persia, Ku-Daena Mountains. Type in Geneva.

Series 2. *Ciliatae* E. Lavrenko. -*M. ciliata* L. Spec. Pl. (1753) 66: Griseb. in Ldb. Fl. Ross. IV, 397; Boiss. Fl. Or. V, 588; Shmal'g. Fl. II, 625 (species 8-12). -Plants grayish-green, with short rhizomes, usually tufted. Panicle spike-like. Spikelets erect before anthesis, nodding at anthesis and later. Lemma densely covered with long white or yellowish hairs only on the margin (from base to summit). Rudiment of terminal floret oblong or lanceolate, naked.

8. *M. transsilvanica* Schur, Enum. Transs. (1866) 764. -*M. ciliata* B. *transsilvanica* Hack. in Halacsy u. Braun, Nachtr. Fl. N.O. (1882) 19. -*M. ciliata* β *varia* Ldb. Fl. Alt. I (1829) 93. -*M. ciliata* Griseb. in Ldb. Fl. Ross. IV, 397 ex parte; Shmal'g. Fl. II, 625 ex parte. -Ic.: Rchb. Ic. Fl. Germ. I, fig. 1574, 1575 (sub *M. ciliata*). -Exs.: Podpera, Fl. exs. Reipubl. Bohem. -Sloven. (1925) 85.

Perennial. Height 30-90 cm; leaf sheaths glabrous and scabrous (var. *glabrata* Celak.), or the lower ones soft-hairy (var. *Bourgaei* Griseb.); leaf blades involute or flat at first. Panicle large, (4) 6-10 cm long and 10-15 mm broad, many-flowered, very dense, equal-sided, spike-like. Spikelets (4) 5-6 (7) mm long, more or less purple-tinged or pale, more rarely somewhat pale golden (var. *flavidula* Podpera). Lower glume 2/3 as long as the upper; the upper glume gradually acuminate. May-July. (Plate XXVI, Figure 3).

Shrubby thickets, forest borders, steppes, rocky places. -European part: Volg. -Kam. (southern part), Mid. Dnep., Volg. -Don., Zavolzh., Prichern., Crimea, Low. Don, Low. Volg.; Caucasus: Ciscauc., Dag., West., East., and South. Transcauc.; West. Siberia: Upp. Tob., Irt.; Alt.; East. Siberia: Ang.-Sayan. (Kavkazskoe, near Minusinsk); Centr. Asia: Pribalkh., Dzung.-Tarb., Tyan'-Shan. Gen. Distr.: Centr. and Atl. Eur. (east. part), Balk. -As. Min. (Bulgaria). Described from Transilvania.

9. *M. glauca* F. Schultz in Flora XLVI (1862) 462. -*M. ciliata* b. 346 *glauca* Richter in Podpera, Kvetna Moravy (1926) 236. -Exs.: Podpera, Fl. exs. Reipubl. Bohem. Sloven. (1926) No 177 (sub *M. ciliata* L. β *glauca* Richter).

Perennial. Height 60-90 cm; leaf sheaths glabrous, scaberulous; leaf blades usually involute, less often subinvolute. Panicle 5-10 cm long and 8-12 mm broad, rather many-flowered and dense, rarely few-flowered and loose, 1-sided, main axis being visible all the way up the panicle. Spikelets

(5) 6-7 mm long, brownish-purple or pale brown; the lower glume nearly as long as the upper or 1/4 shorter; the upper glume gradually acuminate. June.

Slopes. -European part: Upp. Dnep. and Mid. Dnep., so far no precise place indications available; in the herbaria of the Botanical Institute in Leningrad there are two specimens of this species, labelled respectively: 1) In collibus Volh. et Podol. Herb. W. Besser; 2) Ad fl. Dnep. (Legit Fedoroff). Gen. Distr.: Centr. Eur., Atl. Eur., Medit. (Spain). Described from Germany (Pfalz).

10. *M. flavescens* (Schur) Simonkai, Enum. Fl. Transs. (1886) 577. -*M. ciliata* b. *flavescens* Schur, Enum. Pl. Transs. (1866) 764; Podpera, Kvetna Moravy (1926) 236. -Exs.: Fl. exs. Austro-Hung. No 1494.

Perennial. Height 60-90 cm; leaf sheaths glabrous, scabrous, or those of lower leaves pubescent; leaf blades involute or subinvolute. Panicle fairly large, 4-10 cm long and 8-12 mm broad, many-flowered, rather dense 1-sided (becoming almost equal-sided in fruit); spikelets (5) 6-7 mm long, golden or pale golden throughout, without any purple tinge; lower glume at least 3/4 as long as the upper; the upper glume gradually acuminate. June-July.

Slopes, stony places. -European part: Prichern. (Odessa, Cherdakly, by Nal'chik River), Low. Don. (Serebryanka, by the river Donets). Gen. Distr.: southeastern part of Centr. Eur. Described from Transylvania.

11. *M. taurica* C. Koch in Linnaea XXI (1848) 395. -*M. ciliata* γ *taurica* Griseb. in Ldb. Fl. Ross. IV (1853) 398; Podpera Kvetna Moravy (1926) 237. -*M. micrantha* Boiss. et Heldr. in Boiss. Diagn. ser. 1. XIII (1853) 53. -*M. ciliata* β *micrantha* Boiss. Fl. Or. V (1884) 589; Shmal'g. Fl. II, 625. -Exs.: Bourg. Pl. Lyciae (1860) No 283 (sub *M. micrantha* Boiss.). -*P. krymskii* [Crimean].

Perennial. Height 30-50 (-70) cm; leaf sheaths glabrous, scabrous; leaf blades narrowly linear, usually involute, less often flat, stiff, scabrous. Panicle narrow, (4) 6-10 (15.5) cm long and (5) 8-11 (12) mm broad, loose, rarely dense, rather 1-sided, the main axis visible all the way up the panicle, at least on one side of it; panicle often interrupted, at least in lower part; spikelets 4-6 mm long, at first pale or purple-tinged, turning golden. Lower glume nearly as long as the upper or somewhat (1/4) shorter; the upper glume pointed sometimes abruptly mucronate. May-July. (Plate XXVI, Figure 2).

Rocky and stony places. -European part: Crimea, Low. Don.; Caucasus: Ciscauc., Dag., West., East, and South. Transcauc.; Centr. Asia: Aral. -Casp. (Mangyshlak-Karatau and Aktau Mountains), Upp. Turkm. Gen. Distr.: Balk. -As. Min., Arm. -Kurd., Iran (north. part). Described from Crimea-southern coast. Type in Berlin.

Explanation to Plate XXVI

1-*Melica canescens* (Rgl.) E. Lavrenko, general view; 2-*M. taurica* C. Koch., inflorescence; 3-*M. transilvanica* Schur., inflorescence; 4-*M. nutans* L., spikelet; 5-*M. picta* C. Koch., spikelet; 6-*M. recunda* Rgl., spikelet; 7-*M. uniflora* Rem., spikelet; 8-*M. Turczaninowiana* Oehl., spikelet; 9-*M. minor* Hack., spikelet; 10-*M. breviflora* Boiss., spikelet; 11-*M. inaequalis* Boiss., spikelet.



12. *M. virgata* Turcz. in Trin. Mem. Acad. Sc. Pétersb., ser. 6, I (1831) 369; Griseb. in Ldb. Fl. Ross. IV, 398; Turcz. Fl. baic. -dah. II, 1, 337.

Perennial. Plants 50-70 cm tall, tufted; culms erect, slender; leaves glabrous, the blades linear, gradually tapering to a fine point, involute; ligule short, 1-1.5 mm long, obtuse, dentate on the margin. Panicle contracted, spike-like, drawn-out interrupted, 10-20 cm long and 8-10 mm broad, sometimes subracemose; spikelets greenish, erect, nodding or somewhat drooping 4-5 mm long, containing 2-3 fertile florets; glumes unequal, ovate, subacute, hyaline, pale, faintly purple-tinged, the larger glume attaining half the length of spikelet; lemma coriaceous, light green or faintly purple-tinged, scarious-margined, prominently nerved on the back and vested with scattered, fairly long hairs. June-July.

Rocks. -East. Siberia: Ang.-Sayan. (Bobroiskii Chain), Daur. Gen. Distr.: Mong. (north.) Described from Zabaikal'e. Type in Leningrad.

13. *M. Turczaninowiana* Ohwi, Symb. ad. fl. As. or. V in Acta phytotaxonomica et geobot., I, 2 (Kioto 1932) 142. -M. Gmelini Turcz. in Trin. Mem. Acad. Sc. Pétersb. sér. 6, I. (1831) 368 non Roth (1789); Griseb. in Ldb. Fl. Ross. IV, 398; Turcz. Fl. baic. -dah. II, 1, 336. -Ic.: Kom. and Al. OpredeI. (Determin.) I, tab. 58.

Perennial. Plants 25-100 (-150) cm tall, tufted; culms erect; leaves scabrous, blades flat, to 8-12 mm broad; ligule to 4 mm long, lacerate. Panicle before flowering contracted, at anthesis and subsequently loose, with spreading branches to 8 cm long; spikelets divergent, ca. 9-15 mm long, containing 2-4 fertile florets; glumes subequal, ovate-oblong, obtuse, reddish-brown, with a wide scarious margin, exceeding half the length of spikelet (nearly as long as the spikelet); lemma subobtuse, pale green or brownish-purple, with a white membranaceous margin and with
350 sparse, fairly long hairs on the back along the nerves (in var. pallidiflora E. Lavrenko glumes pale yellow, lemma pale green). June-August. (Plate XXXVI, Figure 8).

Rocks, grass-covered mountain slopes. -East. Siberia: Ang.-Sayan. (southeast. part), Daur.; Far East: Ze., Bur., Ussur. Gen. Distr.: Mong. (north). Described from Zabaikal'e. Type in Leningrad.

Section 2. *Eumelica* Aschers. Fl. Prov. Brandenb. I (1864) 839. -Leaves flat. Lemma glabrous, obtuse.

14. *M. altissima* L. Sp. Pl. (1753) 66; Griseb. in Ldb. Fl. Ross. IV, 399; Shmal'g. Fl. II, 625. -Ic.: Rchb. Ic. Fl. Germ. I, Tab. 72, fig. 1579. -Eks.: HFR No 647.

Perennial. Plants 0.9-1.5 m tall, with creeping rhizomes; culm erect, scabrous above; leaves scabrous, with dark green, broadly linear blades; ligule oblong. Panicle more or less interrupted below, dense in upper part, 1-sided, the short branches pubescent below the spikelets; spikelets ca. 10 mm long; with 2 fertile florets and a pyriform rudiment; glumes shorter than the lemmas, subobtuse, pale or dark purple with pale margin, or, more rarely, purplish on the margin, 7-nerved, glabrous (in var. *atro-purpurea* Host-glumes and lemmas dark purple). June-July.

Shrubby thickets and borders of forests. -European part: Upp. Volg. (along Oka River), Volg.-Kam., Mid. Dnep., Volg.-Don., Zavolzh., Prichern., Low. Don., Low. Volg. (along Volga River); Caucasus: Cis-cauc., Dag., East. and South. Transcauc.; West. Siberia: Upp. Tob., Irtysh.

Alt.; East. Siberia: Ang.-Sayan (Kamenka on Enisei); Centr. Asia: Aral.-Casp. Dzung. -Tarb., Pam.-Al., Tyan'-Shan, Gen. Distr.: Centr. Eur., southeast. part), Balk.-As. Min. (north. part), Dzung.-Kashg. Described from Siberia. Type in London.

15. *M. uniflora* Retz. Obs. I (1779) 10; Griseb. in Ldb. Fl. Ross. IV, 400; Shmal'g. Fl. II, 626. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 72, fig. 1576.

Perennial. Plants 20-40 (-60) cm tall, forming loose tufts, with a creeping rhizome; culms slender, weak; leaves scabrous; ligule cylindrical, with a subulate appendage opposite the blade. Panicle very loose, few-flowered, with long, slender, erect branches; spikelets 5-6 mm long, erect, with a single perfect floret glumes subobtusate or short-acuminate, reddish-brown, rarely pale; lemma coriaceous, obscurely 5-nerved. June-July. (Plate XXVI, Figure 7).

Shady forests. -European part: Mid. Dnep. (Podoliya); Caucasus: Ciscauc., Dag., West. and East. Transcauc. Gen. Distr.: Scand., Centr. and Atl. Eur., West. Medit., Balk.-As. Min. Described from Scandinavia. Type in Lund.

351 16. *M. nutans* L. Sp. Pl. (1753) 66; Griseb. in Ldb. Fl. Ross. IV, 399; Shmal'g. Fl. II, 625. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 72, fig. 1577. -Exs.: HFR No 499.

Perennial. Plants 30-60 cm tall, with a fairly long, rooting rhizome; culms below inflorescence and leaf sheaths scabrous; leaf blades with sparse hairs on the upper surface; ligule very short, not exceeding 1 mm, obtuse, brownish. Panicle contracted, 1-sided, subracemose, containing few spikelets, drooping at the top; glumes obtuse, reddish-purple, white-membranaceous on the margin (in var. *argyrolepis* Kom., in Manchuria, glumes entirely white, lustrous; inflorescence not drooping; with transitions towards the typical form). Lemma greenish, narrowly hyaline-rimmed at the summit, often faintly reddish-purple on the margin, scabrous on the back, prominently nerved. May-June. (Plate XXVI, Figure 4).

Shady forests, less often dense scrubs. -European part: Kar.-Lap., Dv.-Pech., Lad.-Il'm., Upp. Volg., Volg.-Kam., Upp. Dnep., Volg.-Don, Zavolzh., Prichern. (northern part), Crimea (mountainous, rarely), Low.-Don (northern part); Caucasus: Ciscauc., Dag., West. and East. Transcauc. (west. part); West. Siberia: Ob., Upp. Tob., Irt., Alt.; East. Siberia: Yenis. (south. part), Ang.-Sayan, Daur., Far East: Ze.-Bur., Ud., Ussur., Sakh.; Centr. Asia: Dzung. -Tarb. (Kul'dzha), Tyan'-Shan (along the river Issyk). Gen. Distr.: Scand., Centr. and Atl. Eur., West. Medit. (north. part), Balk.-As. Min. (west. part), Jap.-Chin. Described from Europe. Type in London.

17. *M. picta* C. Koch in Linnaea XXI (1848) 395; Shmal'g. Fl. II, 626. -*M. nutans* β *picta* Griseb. in Ldb. Fl. Ross. IV (1853) 400. -*M. viridiflora* Czern. Consp. pl. Charc. et Ucr. (1859) 73.

Perennial. Closely related to the preceding species, from which it differs in the following: plants 30-40 cm tall, forming small, loose tufts, with very short rhizomes; leaf blades more scabrous on the upper surface and on the margin; ligule longer (to 2.5 mm), ovate, whitish. Glumes greenish, somewhat reddish-purple only near the scarious margin (var. *viridiflora* Seemen), rarely reddish-purple all over the back (var. *rubriflora* Seemen); lemma obscurely nerved, smooth, lustrous. May-June. (Plate XXVI, Figure 5).

Light forests, scrubs. -European part: Upp. Volg. (along the river Oka), Upp. Dnep. (Grodnitsa), Mid. Dnep., Volg. -Don., (southwest. part), Prichern., Low. Don. (north. part, to the east of Saratov); Caucasus: Ciscauc., East. Transcauc. (west. part of the region), South. Transcauc. Gen. Distr.: Centr. Eur., Balk. - As. Min. Described from Caucasus (Min-greliya, etc.). Type in Berlin.

18. *M. minor* Hack. in Boiss. Fl. Or. (1884) 586.

Perennial. Plants 25-40 cm tall, tufted; culms bunched, slender, sometimes geniculate, smooth; leaves narrowly linear, acute, firm, scabrous, spreading; ligule very short, often obsolete. Panicle interrupted, few-
352 flowered, often subracemose; spikelets fairly short-pedicelated, erect at first, then drooping, 3-flowered; upper floret sterile; glumes subobtusate, dark purple, with a wide white fringe; lemma glabrous, lustrous, obscurely 5-7-nerved. June-August. (Plate XXVI, Figure 9).

Rocks in the alpine zone. -Caucasus: Ciscauc., Gr. Caucasus (Lars, etc.), Dag. (south.). Endemic for the main Caucasian chain. Described from Dagestan. Type in Geneva. Cotype in Leningrad.

19. *M. secunda* Rgl. in A.H.P. VII (1880) 629. -*M. interrupta* Hack. (olim n. sp.) in herb. Leningrad. -*M. secunda* var. *interrupta* Hack. Gram. nov. turdestan, in A.H.P. XXVI (1906) 58.

Perennial. Plants (20) 30-60 cm tall, forming fairly compact tufts; culms erect, smooth, slender, leafy all the way up; leaves narrowly linear, sometimes subinvolute, long-acuminate, straight, smooth or scaberulous. ligule oblong. Panicle elongate, narrow, 1-sided, sometimes interrupted, the straight branches bearing few spikelets; spikelets 5-8 mm long, spreading, oblong (glumes and lemmas narrower and more elongated than in *M. nutans* and *M. picta*), with markedly distant florets; glumes broadly hyaline on the margin, lustrous, whitish or somewhat purple at the base, oblong, obtuse; lemma lanceolate-linear, hyaline-margined, pale green (occasionally somewhat purplish), obtuse, scaberulous on the back, obscurely 5-7-nerved. May-August. (Plate XXVI, Figure 6).

Mountains, rocks, stone drifts. -Cent. Asia: Pam.-Al., Tyan' Shan. Gen. Distr.: Iran. Described from Alai Chain (between Karakasuk and Shakhimardan). Type in Leningrad.

Genus 158. DIARRHENA* P.B. **

P.B. Agron. (1812) 142.

Inflorescence a many-flowered panicle. Spikelets 3-flowered, with hyaline glumes and stiff, awnless lemmas clothed with bristles on the nerves and keel. Lodicules 2, ovoid, naked. Stamens 2. Caryopsis elongate, indurate, dark brown, with a blunt, light-colored beak.

1. Panicle narrow, with appressed branches; spikelets sublinear; caryopsis shorter than the lemmas 1. *D. manshurica* Maxim.

* From Greek *dis* - two, and *arren* - male, alluding to the two stamens.

** Compiled by V. L. Nekrasova.

+ Panicle open; spikelets lanceolate-elliptic; caryopsis longer than the lemmas 2. *D. japonica* Franch. et Sav.

1. *D. manshurica* Maxim. in Mel. Biol XII (1888) 932.

353 Perennial. 80-100 cm tall; rhizome creeping; leaves thin, broad (10-15 mm); ligule short-truncate, bearded at the base; spikelets oblong, sublinear, falling early, 3-flowered; glumes hyaline, pale; the upper glume broadly ovate, acuminate, much larger than the narrowly lanceolate, obtuse lower glume; lemma elongate-ovate, 3-nerved, hispid on the nerves; palea navicular, 2-keeled, the keels hispid. Caryopsis shorter than the lemma and palea. June-August. (Plate XXVII, Figure 3).

Taiga.-Far East: Ze.-Bur., Ussur. Gen. Distr.: Jap.-Chin. Described from Sungacha River. Type in Leningrad.

2. *D. japonica* Franch. et Sav. Enum. Pl. Jap. II (1879) 603. -

Onoea japonica Fr. et Sav., l.c. 178.

Similar to the preceding, but panicle very open, with lance-elliptical spikelets; caryopsis exserted from lemma and palea. June-August. (Plate XXVII, Figure 4).

Mixed forests.-Far East: Ussur. (Suifun River basin). Gen. Distr.: Jap.-Chin. Described from Nippon Island, Nikko. Type in Paris.

Genus 159. PLEUROPOGON* R. BR.**

R. Br. in Parry. Voy. (1824) App. p. CCLXXXIX (em. typ. CLXXXIX).

Inflorescence racemose, 1-sided. Spikelets fairly large, 8-14-flowered, linear. Glumes unequal, obtuse, small. Lemmas and paleas scarious at the tip; lemmas with rounded back, 7-nerved, short-awned or mucronate; palea with 2 keels, each bearing 2, more rarely 3, aristate appendages. Pistils 2; stigmas plumose.

1. *P. Sabini* R. Br. in Parry Voy. (1824), l.c.; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 275, -l.c.: Parry, l.c. tab. D.: Fedch. and Fler. Fl. Evr. Ross. (Fl. Eur. Russ.) Fig. 106.

Perennial. Culms 20-35 cm tall, erect, smooth; leaves flat, linear, leaves flat, linear, leaves of innovations 1/3 as long as the culm, culm leaves still shorter; ligule obtuse, broadly ovate. Inflorescence a 1-sided raceme of 5-9 spikelets; spikelets many-flowered, linear, compressed; glumes small (ca. 2 mm), hyaline, purple, toothed at the tip; lemmas and paleas purple, with scarious margins; lemmas obovate, involute, 7-nerved; palea elliptical-lanceolate; caryopsis oval, 2.5 mm long, brownish. July-August. (Plate XXVII, Figure 5, a).

Wet tundra, along borders of streams.-Arctic: Nov. Zem., Arct. Sib.; West. Siberia: Alt. Gen. Distr.: Arct. Amer. and California. Described from N. Am., from Melville Island. Type in London, cotype in Leningrad.

* From Greek *pleura* - side of body, and *pogon* - beard, alluding to aristate appendages of the palea.

** Compiled by V. L. Nekrasova.

Genus 160. BRYLKINIA* Fr. SCHMIDT**

Fr. Schmidt, Reisen in Amurl. (1868) 199.

Inflorescence a rather loose, 1-sided raceme. Spikelets short-pedicelated, with two reduced florets, consisting of empty lemmas and a single perfect floret with a lemma and palea. Lemmas prolonged into rather long awns. Lodicules 2, truncate. Stamens 3. Caryopsis elongate, slightly compressed.

1. *B. caudata* (Thbg.) Fr. Schmidt, Reisen in Amurl. (1868) 199. - *Alopecurus caudatus* Thbg. in Nov. Act. Ups. III (1780) 208. - *Ehrharta caudata* Munro in A. Gray, Bot. Jap. in Mem. Am. Acad. N.S., VI (1858-59) 420. - Ic.: Fr. Schmidt, l.c., tab. 8, fig. 22-27.

Perennial. Plants 50 cm tall; leaves long-acuminate, 4-5 mm broad, glabrous on the upper surface, rough on the margins and on the midnerve underneath; raceme many-flowered; spikelets strongly laterally compressed; glumes linear-subulate, the lower glume half as long as the spikelet, 3-nerved, the upper glume 1-nerved - the two lower florets infertile destitute of paleas, only the upper floret fertile, furnished with a palea; all lemmas with 2 nerves and a keel, setose on the margin and extended into awn which is longest in the upper floret; caryopsis naked. July-August. (Plate XXVII, Figure 6, a).

Coniferous forests. - Far East: Sakhalin (West. coast, Vladimirovka). Gen. Distr.: Jap. - Chin. Described from Sakhalin. Type in Leningrad.

Genus 161. BRIZA† L.

L. Sp. pl. (1753) 70.

Inflorescence an open, more rarely contracted, panicle. Spikelets broad, rounded, many-flowered, laterally compressed. Glumes subequal, slightly shorter than the lemmas, obtuse, more or less ventricose. Lemmas cordate-ovate, similarly obtuse and ventricose, enveloping the 2-keeled palea. Lodicules oblong, toothed. Stamens 3; ovary naked. Pistil short; stigmas plumose; caryopsis united with the palea.

1. Spikelets 1-2 cm long 1. *B. maxima* L.
- + Spikelets never attaining 1 cm in length 2.
2. Annual plants 3.
- + Perennial plants 4.
3. Inflorescence narrowly linear, short-branched, subracemose. Spikelets oval-conical 2. *B. spicata* Sibth. et Sm.
- 355 + Inflorescence an open, long-branched panicle; spikelets triangular-ovate 3. *B. minor* L.
4. Plants 10-30 cm tall; spikelets 3-6 (7)-flowered; glumes and lemmas more or less black-purple, with a white, membranaceous margin 4. *B. Marcowiczii* G. Woron.
- + Plants 30-60 (-100) cm tall; spikelets 5-12-flowered; glumes and lemmas green or slightly purplish 5.

* Named for the topographer Brylkin, travelling guide of Schmidt and Glen.

** Compiled by V. L. Nekrasova.

† From Greek *briza* - name of a kind of grain cereal (most probably *rye*), recorded by Galen.

5. Panicle branches erect; spikelets 9-12-flowered, 7-8 mm long

..... 5. *B. elatior* Sibth. et Sm.

+ Panicle branches more or less horizontally set; spikelets 5-9-flowered, 4-7 mm long 6. *B. media* L.

1. *B. maxima* L. Sp. pl. (1753) 70. -*l.c.*: Rchb. *l.c.* Fl. Germ. I, tab. 92, fig. 1666. -*Exs.*: Kneuck. Gram. *exs.*, No 41.

Annual. Plants branching at the base; culms 20-60 cm tall, glabrous, smooth; leaves linear-lanceolate, to 7 mm broad, flat, scaberulous on the upper surface smooth underneath; ligule 2-4 mm long, pointed. Panicle 5-10 cm long, containing 3-8 spikelets, with slender, scabrous branches; spikelets ovate, to 2.5 cm long and 1.5 cm broad, 5-20-flowered, tinged golden-pink, finally brownish; glumes ovate, strongly convex, to 6 mm long; lemmas ca. 8 mm long, the lemma of the upper floret sparsely clothed with short hairs, more rarely glabrous. May-July. (Plate XXVII, Figure 7).

Stony places, also dry meadows. -European part: Low. Don (so far the only occurrence-Krasnoarmeisk (Sarepta), Klaus, 1847). Gen. Distr.: Medit. Described from Italy and Portugal. Type in London.

ECONOMIC IMPORTANCE. Used in arrangement of dry bouquets and sometimes cultivated in gardens for this purpose.

2. *B. spicata* Sibth. et Sm. Fl. graec. I (1806) 61; Griseb. in Ldb. Fl. Ross. IV, 366; Shmal'g. Fl. II, 627. -*Briza humilis* M.B. Fl. taur.-cauc. I (1809) 66. -*l.c.*: Sibth. et Sm., *l.c.*, tab. 77. -*Exs.*: Heldr. herb. norm. No 217 et 1299.

Annual. Tufted; culms 15-35 cm tall, glabrous, smooth; leaves narrowly linear, 1-2 (-3) mm broad, flat or folded; ligule to 4 mm long. Inflorescence a narrowly linear, subspicate panicle, to 10 cm long, with short, prominently scabrous branches; spikelets ovate or oblong-conical, ca. 5 mm long and nearly as broad, 6-9-flowered, green; glumes obovate, subacute; lemmas resembling glumes in shape and size, also scabrous in upper part. April-July. (Plate XXVII, Figure 8, a).

Mountain slopes and steppes. -European part: Crimea; Caucasus: Cis-cauc., West. Transcauc. Gen. Distr.: Balk. -As. Min. Described from Greece. Type in England (Oxford).

356 3. *B. minor* L. Sp. pl. (1753) 70; Griseb. in Ldb. Fl. Ross. IV, 366. -*l.c.*: Rchb. *l.c.* Fl. Germ., I tab., fig. 1664. -*Exs.*: Kneuck. Gram. *exs.* No 131.

Perennial. Plant branching at the base; culms more or less ascending, 15-40 cm tall, glabrous, scaberulous; leaves linear-lanceolate, to 8 mm broad, rather scabrous; ligule lanceolate, to 10 mm long. Panicle to 10 cm long, open, with filiform, twice or thrice divided branches; spikelets small, ca. 3 mm long, 5-7-flowered, triangular-ovate, whitish-green; glumes ca. 2 mm long, navicular, inflated, slightly colored; lemma also strongly convex, naked, lustrous. May-June. (Plate XXVII, Figure 9).

Sandy meadows. -Caucasus: West., East., and South. Transcauc., Tal. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk. -As. Min. Described from Switzerland. Type in London.

ECONOMIC IMPORTANCE. Presence of glucosides containing prussic acid has been established (Couperot).

4. *B. Marćowiczii* G. Woron. in Opred. rast. Kavk. i Kryma (Determ. Plants of Cauc. and Crimea) I (1908) 116 et Sched. ad G. Woron.

et A. Schelkown. Herb. Fl. Cauc. fasc. II-IV (1914) 35 diag. - *B. media* f. *caucasica* Marcow. in Acta Horti Jur. IV (1903) 241. - Exs.: Herb. Fl. Cauc., No 109.

Perennial. Forming loose tufts; rhizome short-creeping; culms to 30 cm tall, slender, glabrous, smooth, with 2-3 nodes; leaves linear-lanceolate, short, glabrous, almost smooth; ligule ca. 1 mm long, rounded. Panicle open, with subhorizontal, slender, solitary branches, each bearing 1-2 spikelets; spikelets small, rounded, to 5 mm long and 7 mm broad, on smooth pedicels; glumes subequal, sharp-pointed, blackish-purple, with a light membranaceous margin; lemmas greenish or yellowish at the base, blackish-purple above, white-membranaceous on the margin. July-August. (Plate XXVII, Figure 10).

Alpine meadows. - Caucasus: Ciscauc. West. Transcauc. Endemic. Described from central Caucasus. Type in Leningrad.

5. *B. elatior* Sibth. et Sm. Fl. graec. I (1806) 57. - *Briza media* β *elatior* Griseb. in Ldb. Fl. Ross. IV (1853) 366. - Ic.: Sibth. et Sm., l. c., tab. 75.

Perennial. Solitary or loosely tufted; culms 70-100 cm tall, glabrous, smooth, only just below the inflorescence scaberulous; leaves linear-lanceolate, scabrous, flat, to 6 mm broad; ligule subobtusate, to 2 mm long. Panicle 20-25 cm long, with erect branches, rather loose; spikelets rounded, often grayish; lemma prominently gibbous at the base, usually green or slightly purplish. June-July. (Plate XXVII, Figure 11)

357 Meadows. - Caucasus: Ciscauc., Dag., East. Transcauc. Gen. Distr.: Balk. - As. Min., Arm. - Kurd. Described from Greece. Type in England (Oxford).

6. *B. media* L. Spec. pl. (1753) 70; Griseb. in Ldb. Fl. Ross. IV, 365; Shmal'g. Fl. II, 627; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 276. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 92, fig. 1665. - Exs.: HFR, No 697.

Perennial. Forming loose tufts; rhizomes short; culms 20-80 cm tall, glabrous, smooth; leaves narrowly linear, flat, to 4 mm broad, leaves of innovations long, those of the culm short, scaberulous on the upper surface; ligule very short, obtuse. Panicle to 15 cm long, contracted at first, then open, with slender, smooth branches and pendent spikelets; spikelets ovate-orbicular, 5-8-flowered, 4-7 mm long, whitish or somewhat purplish; glumes obovate, equal; lemmas naked, slightly gibbous. May-July. (Plate XXVII, Figure 12).

Meadows and forest borders; in mountains up to the subalpine zone. - European part: all regions, except Low. Volg.; Caucasus: all regions up to subalpine zone. Gen. Distr.: Scand. (south. part), centr. and Atl. Eur., north. part of Medit., Balk. - As. Min., Arm. - Kurd. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. A forage plant of secondary importance, readily eaten by livestock, especially by sheep. Not suitable for cultivation in artificial meadows on account of the restricted development of foliage, but may be included in mixtures with other grasses.

Genus 162. AELUROPUS* TRIN.

Trin. Fund. Agrost. (1820) 143.

Inflorescence a spikelike panicle, with short branches, sometimes subcapitate, dense. Spikelets many-flowered, ovoid-lanceolate, laterally compressed, imbricate on the branches in two rows. Glumes shorter than the lemmas, keeled. Lemmas 7-9-nerved, keeled in upper part, mucronate. Palea obtuse, 2-keeled. Lodicules slender, blunt; stamens 3; stigmas plumose, on long styles. Caryopsis oblong, free, unfurrowed. Perennials with long, creeping stolons, strongly branched, rigid.

1. Spikelets naked, 4-5 mm long, 5-10-flowered. Lemmas mucronate 1. *A. litoralis* (Gouan) Parl.
+ Spikelets densely pubescent or lanate, 3-4 mm long, 3-5-flowered.
Lemma subobtuse, but terminating in a mucro 2. *A. repens* (Desf.) Parl.

1. *Ae. litoralis* (Gouan) Parl. Fl. Ital. I (1848) 461; Griseb. in Ldb. Fl. Ross. IV, 369; Boiss. Fl. Or. V, 594; Shmal'g. Fl. II, 629; Kryl. Fl. Zap. Sib. II, 276. - *Poa littoralis* Gouan, Fl. Monsp. (1765) 470. - *Dactylis littoralis* Willd. Sp. pl. I, 1 (1797) 408. - *Aeluropus laevis* Trin. in Steud. Nom. bot. I (1841) 30 non Trin. Fund. Agrost. (1820) 143. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 59, fig. 1520. - Exs.: Edit. Hort. Bot. Petri Mag., No 55.

- 358 Perennial. Plant grayish-green, with long stolons, branching at base and rooting at the nodes; culms procumbent, ascending, leafy, 20-60 cm tall, prominently scabrous in upper part; leaves narrowly linear, 2-ranked, rigid, flat or involute; blades and sheaths glabrous or clothed with long, thin hairs (var. *dasyphylla* Trautv.); ligule very short, covered with straight hairs. Panicle spikelike, more rarely subcapitate, 1.5-7 cm long, with short, prominently scabrous branches. Spikelets 3-5 mm long, ovate, 3-10-flowered, naked; glumes 7-9-nerved, with hyaline margins; lemma keeled, also 7-9-nerved, obtuse, with a short mucro. April-July. (Plate XXVII, Figure 13).

Solonchaks and brackish sands. - European part: Prichern., Crimea, Low. Don, Low. Volg.; Caucasus: Ciscauc., Dag., East. and South. Transcauc.; East. Siberia: Upp. Tob., Irt., Alt.; Centr. Asia: all regions. Gen. Distr.: Medit., Balk. - As. Min., Arm. - Kurd., Iran, Ind. - Him., Dzung. - Kashg. Described from southern France. Type in London.

NOTE. An outstandingly salt-resistant plant, furnishing satisfactory fodder; readily eaten, especially in fall, by horses and cattle, less readily by sheep and goats. Yields up to 8-10 centners of hay per hectare. Describes detailed investigation with a view to reclamation of bad solonchaks.

2. *Ae. repens* (Desf.) Parl. Fl. Ital. I (1848) 462; Griseb. in Ldb. Fl. Ross. IV, 369. - *Dactylis repens* Desf. Fl. atl. I (1798) 79. - *Aeluropus villosus* Trin. Fund. Agrost. (1820) 143. - Exs.: HFR No 293. - Exs.: HFR No 296 (sub *Ae. villosus* Trin.).

* From Greek *aeluros* - cat, and *pous* - foot.

Perennial. Plant grayish-green, the long stolons branching at base and rooting at the nodes; culms 7-30 cm tall, ascending, leafy, puberulent; leaves narrowly linear, 2-ranked, stiff, involute; blades and sheaths pilose; ligule very short, covered with long hairs. Inflorescence short, dense, oblong or capitate, 1-2 cm long, with very short branches; spikelets ovate, short, 3-5-flowered; glumes 7-9-nerved, membranaceous on the margin, clothed with hairs; lemma 7-9-nerved, obtusish or short-mucronate, also hairy. May-August. (Plate XXVII, Figure 14).

Sandy and saline places. -Caucasus: East. and South. Transcauc.; West. Siberia: Irt.; Centr. Asia: Kyz.-Kum, Kara-Kum, Upp. Turkm., Amu-Dar., Pam.-Al. Gen. Distr.: East. Medit., Iran. Described from North Africa. Type in Florence.

Genus 163. DACTYLIS* L.**

L. Gen. pl. 5 (1754) 32.

Inflorescence paniculate, lobed, 1-sided, with 3-angled axis and branches arranged only on two sides of the axis. Spikelets 3-5-flowered, short-pediceled, laterally compressed, crowded in compact fascicles at the ends of branches and branchlets. Glumes subequal, shorter than the lemmas, carinate, acute. Lemmas 5-nerved, keeled, produced into a short awn. Palea with 2 keels, bidentate at the summit. Lodicules bidentate. Stamens 3; pistil with elongated style and plumose stigmas. Caryopsis oblong, furrowed on the inside.

1. Lemmas with a notch at the base of the short awn; leaves coarse, narrowly linear, sometimes involute; panicle contracted, short-branched 2. *D. Woronowii* Ovcz.
- + Lemma tapering gradually into a short awn, without a notch at the summit; tall plant, with thin, noninvolute leaves 1. *D. glomerata* L.

Explanation to Plate XXVII

1-*Sphenopus divaricatus* (Gouan) Rehb., inflorescence; 2-*Cutandia memphitica* (Spr.) Richt., inflorescence, a) spikelet; 3-*Diarthema manshurica* Maxim., spikelet; 4-*D. japonica* Franch. et Sav., spikelet; 5-*Pleuropogon Sabinii* R. Br., inflorescence, a) spikelet; 6-*Erykinia caudata* (Thbg.) F. Schm., inflorescence, a) spikelet; 7-*Briza maxima* L., spikelet; 8-*B. spicata* Sibth. et Sm., inflorescence, a) spikelet; 9-*B. minor* L., spikelet; 10-*B. Marcowiczii* G. Woon., spikelet; 11-*B. elatior* Sibth. et Sm., spikelet; 12-*B. media* L., spikelet; 13-*Aeluropus litoralis* (Gouan) Parl., inflorescence, a) spikelet; 14-*Ae. repens* (Desf.) Parl., spikelet; 15-*Dactylis glomerata* L., inflorescence, a) spikelet; 16-*Cynosurus cristatus* L., inflorescence, a) cluster of spikelets; 17-*C. echinatus* L., inflorescence, a) group of spikelets; 18-*C. elegans* Desf., inflorescence, a) group of spikelets; 19-*Sclerochloa dura* (L.) P. B., inflorescence, a) spikelet; 20-*Schismus arabicus* Nees, inflorescence, a) spikelet, b) tip of lemma; 21-*Sch. calycinus* (L.) Desv.-Jouve, inflorescence, a) spikelet, b) tip of lemma.

* From Greek *dactylos* - a finger.

** Compiled by P. N. Ovcshnikov.



1. *D. glomerata* L. Sp. pl. (1753) 71; Griseb. in Ldb. Fl. Ross. IV, 368; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II (1928) 277. - Exs.: Kneucker, Gram. exsicc. No 350.

Perennial. Rhizome short, thickened, short-creeping, with a profusion of fibrous, thin roots; forming loose, big tops with numerous flat, broadly linear, rather prominently scabrous leaves, to 5-6 mm broad; sheaths mostly shorter than the internodes; blades and sheaths covered underneath with very short, ciliate hairs or glabrous; ligule to 6 mm long, oblong-ovate, fimbriate-lacerate at the tip. Panicle laterally compressed, 6-8 cm long, with long branches of first order (especially the lower ones); spikelets aggregate in compact fascicles on branches of first order or on special branches of second order. Panicle broadly lanceolate at anthesis; then contracted; spikelets 3-4 (2-8)-flowered, 6-7 mm long, oblong-obovoid; 362 lower glume to 6.5 mm long, stiff, with short, frail cilia on the keel, often with minute hairs scattered all over near the base, or glabrous, gradually tapering into a short awn-point; upper glume to 6 mm long, very short-ciliate on the keel, more or less membranaceous, obscurely nerved, gradually tapering into an awn-point; lemma 6-6.5 mm long, 4-nerved, oblong-lanceolate, short-ciliate above on the keel, minutely ciliolate on the margin, gradually produced at apex into awn (to 1 mm long); palea hyaline, minutely ciliolate on the keel, attenuate toward the apex, lance-elliptical. Anthers 2-2.6 mm long. June-July. (Plate XVII, Figure 15, a).

Flood and dry-valley meadows, forest borders, light deciduous forests, mainly in the forest and forest-steppe zones; occasionally steppe meadows - European part: all regions except arctic zone, South. Crimea and part of Low Volg. region; Caucasus: Ciscauc., Gr. Cauc., West., East., and South. Transcauc.; West. Siberia: Ob. region, upp. Tob., Irt., Alt.; East. Siberia: Yenisei, Ang. - Sayan.; Centr. Asia: Dzung. - Tarb., Tyan'-Shan., Pam. - Al., Amu-Dar., Syr-Dar. Gen. Distr.: Eur. except arctic region; also introduced into North Amer. Described from Europe. Type in London.

NOTE. Excellent fodder plant introduced into cultivation. Upon detailed analysis, this species will undoubtedly fall into various races. It may already be assumed that a distinct race exists in central Asia.

2. *D. Woronowii* Ovcz. sp. nova in Addenda p. 752. - *D. glomerata* β *hispanica* Griseb. in Ldb. Fl. Ross. VI (1853) 369 non Roth. - E. Voronova.

Perennial. This species differs from the preceding in stiffer, narrower, often folded leaves, more compact growth, shorter culms, shorter, compact panicle, the lowest branch rudimentary, convergent; spikelets 5-6 mm long, mostly 4-(6)-flowered; lower glume distinctly narrowly emarginate at the base of the short prickly awn, with long hairs on the keel, glabrous or sparsely pubescent elsewhere; anthers to 2.4 mm long, slightly divergent at the base. May-June.

Mountain slopes, hollows, and dry meadows. - European part: Crimea; Caucasus: mainly East. Transcauc.; but also West. and South. Transcauc., Dag.; Centr. Asia: Upp. Turkm., Amur-Dar. Endemic. Described from upper Turkmenistan near Ashkhabad, 2898, No. 2199. D. Litvinov. Type in Leningrad.

Genus 164. CYNOSURUS* L.

L. Gen. pl. (1737) 13.

Inflorescence dense, 1-sided, spike-like. Spikelets 2-many-flowered, short-pedicelled, aggregate in fascicles. Some spikelets sterile, consisting of glumes only, others fertile, 3-5-flowered. Glumes subequal, 363 scabrous on the keel. Lemmas 3-5-nerved, mucronate or awned from the bidentate summit. Palea with 2 ciliate keels. Stamens 3. Ovary naked; stigmas plumose.

1. Perennial; inflorescence more or less linear. Glumes of sterile spikelets mucronate, awnless. 1. *C. cristatus* L.
- + Annuals; inflorescence more or less ovoid or globular. Glumes of sterile spikelets long-awned. 2.
2. Plants 30-60 cm tall. Ligule to 7 mm long. Fertile spikelets to 10 mm long. 2. *C. echinatus* L.
- + Plants 5-20 cm tall. Ligule to 2 mm long. Fertile spikelets to 5 mm long. 3. *C. elegans* Desf.

1. *C. cristatus* L. Sp. pl. (1753) 72; Griseb. in Ldb. Fl. Ross. IV, 348; Shmal'g. Fl. II, 627. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 7, fig. 1351, 1352. Exs.: HFR No 747.

Perennial. Plant 20-60 cm tall, tufted; culms erect, slender, smooth; leaves narrowly linear, ca. 2 mm broad, flat, more rarely folded; ligule ca. 1 mm long. Panicle spike-like, 1-sided, 3-7 cm long; fertile spikelet 3-5-flowered, ca. 3 mm long, with sterile spikelets in pectinate-plumose aggregates at its base; glumes subequal, scabrous on the keel; lemmas 3-5-nerved, acuminate or short-awned. June-July. (Plate XXVII, Figure 16, a).

Meadows and glens. -European part: Dv. -Pech., Lad. -Il'm., Upp. Volg., Volg. -Kam., Upp. Dnep., Volg. -Don., Prichern. (?), Crimea; Caucasus: Ciscauc., West. East., and South. Transcauc., Tal. Gen. Distr.: Scand., Centr. and Atl. Eur., Medit., Arm. -Kurd. Described from Europe. Type in London.

NOTE. Does not attain its full development by the time of hay cutting, and therefore furnishes plenty of aftergrowth. Does not fear drought, but prefers a humid climate. A valuable, highly nutritious grass. On wet soils it produces tall growth, yielding plenty of herbage, especially in the second cut. In dry place it remains low and is more suitable as a pasture plant, especially for sheep. In some places its culms are used for making baskets.

2. *C. echinatus* L. Sp. pl. (1753) 72; Griseb. in Ldb. Fl. Ross. IV, 348; Shmal'g. Fl. II, 628. -*Chrysurus echinatus* P. B. Agrost. (1812) 123. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 7, fig. 1349, 1350. -Exs.: HFR No 497.

Annual. Plant 30-60 cm tall, branching in bunches at the base; culms slender, smooth; leaves linear, flat; ligule oblong, to 7 mm long; inflorescence dense, ovoid or oblong, 1-4 cm long, 1-sided, with short

* From Greek *kynos* - dog, and *oura* - tail.

branches; sterile spikelets consist of long-awned bracts, in pectinate distichous arrangement; fertile spikelet compact, 2-3-flowered, to 10 mm long; glumes hyaline, subulate-pointed; lemmas lanceolate, to 8 mm long, with awn to 15 mm long. May-July. (Plate XXVII, Figure 17, a).

Dry, barren and stony places. - European part: Kar. - Lap. (near the town Kola, on railway embankment, introduced), Crimea; Caucasus: all regions. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk. - As. Min., Arm. - Kurd. Described from southern Europe. Type in London.

3. *C. elegans* Desf. Fl. Atl. I (1798) 82. - *Chrysurus elegans* Roem. et Schult. Syst. II (1817). - Exs.: Kneucker, Gram. exs. No 134.

Annual. Plant 5-20 cm tall; culm usually solitary, slender, glabrous; leaves narrowly linear, to 2 mm broad, rather flat; ligule to 2 mm long. Inflorescence ovoid-oblong, not compact, 1-2 (3) cm long, 1-sided; sterile spikelets consisting of long-awned bracts pectinately arranged in two ranks; fertile spikelet compact, 2-3-flowered, to 5 mm long; glumes hyaline, subulate-pointed; lemmas lanceolate, to 3 mm long, with awn to 4 mm long. April-May. (Plate XXVII, Figure 18, a).

In juniperous forests. - Central Asia: Upp. Turk. Gen. Distr.: Medit., Iran. Described from Algeria. Type in Florence.

Genus 165. *SCLEROCHLOA** P. B.

F. B. Agrost. (1812) 97.

Inflorescence a spike-like, 1-sided panicle, few-branched, turning into a spike in upper part; spikelets 3-5-flowered, borne on short, thick pedicels; glumes obtuse, unequal, with hyaline margins. Lemmas longer than glumes, indurate, prominently 5-nerved, hyaline-margined. Palea hyaline, 2-keeled. Stamens 3. Styles 2, with long, short-plumose stigmas.

1. *S. dura* (L.) P. B. Agrost. (1812) 177; Griseb. in Ldb. Fl. Ross. IV, 377. - *Cynosurus durus* L. Sp. pl. (1753) 72. - *Poa dura* Scop. Fl. Carn., ed. 2, I (1772) 70. - *Festuca dura* Vill. Fl. Dauph. II (1787) 94. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 58, fig. 1516. - Exs.: HFR No 1147.

Annual. Plant 5-20 cm tall, tufted; culms branching at the base, geniculate-ascending, leafy, glabrous; leaves linear-lanceolate, glabrous; ligule short, pointed. Panicle to 5 cm long, dense, contracted, with short, stout branches; spikelets green, linear-lanceolate, to 1 cm long, 3-5-flowered; glumes unequal, the lower half as long as the upper; lemmas coriaceous, keeled, subobtusely. March-June. (Plate XXVII, Figure 19, a).

Clay slopes and roadsides. - European part: Upp. Dnep., Med. Dnep., Crimea, Prichern., Low. Don; Caucasus: all regions; Centr. Asia: Kara-Kum., Upp. Turk., Amu-Dar., Syr-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: Medit., Centr. Eur., Balk. - As. Min., Arm. - Kurd., Iran. Described from southern Europe. Type in London.

365 ECONOMIC IMPORTANCE. A good pasture plant, but occurring in small quantities.

* From Greek *scleros* - hard, and *chlos* - green.

Genus 166. SCHISMUS* P. B.

P. B. Agrost. (1812) 73, tab. 15, fig. 4.

Panicle containing numerous spikelets, contracted, short. Spikelets 5-8-flowered, laterally compressed, perfect, with brittle rachilla. Glumes longer than the lemmas, keeled, membranaceous-margined. Lemmas prominently nerved, bilobed, sometimes mucronate or awned from between the lobes. Palea 2-keeled. Stames 3. Styles long, with short-plumose stigmas. Caryopsis free.

1. Lemmas ca. 3 mm long, covered with rather long hairs, bifid at the apex down 1/3-1/2 their length, with divergent lobes 1. *S. arabicus* Nees.
- + Lemmas ca. 2 mm long, more or less short-pilose, bifid at the apex down 1/5-1/4 of their length, with nondivergent lobes 2.
2. Lemmas bifid at the apex down 1/5 of their length, with or without a short mucro within the notch 2. *S. calycinus* (L.) Duv.-Jouve.
- + Lemmas bifid at the apex down 1/4 of their length, awned from the notch, the awn as long as the teeth or longer 3. *S. minutus* (Hoffm.) Roem. et Schult.

1. *S. arabicus* Nees. Fl. Afr. austr. (1841) 422. -Exs.: Bornmuel-
ler, It. Syriacum (1897) No 1689.

Annual. Plants 5-20 cm tall; tufts small; culms numerous, slender, glabrous; leaves narrowly linear, rather involute; ligule hairy. Panicle oblong, to 3 cm long, contracted; spikelets 7-8 mm long, 5-8-flowered, pale green; glumes long-acuminate, keeled, hyaline-margined; lemmas ca. 3 mm long, covered with rather long hairs, bifid at the apex down 1/3-1/2 their length, with divergent lobes. March-April. (Plate XXVII, Figure 20, a, b).

Dry, sandy places. -Caucasus: East. and South. Transcauc.; West. Siberia; Upp. Tob. (former Ural'skii Raion); Centr. Asia: Aral.-Casp., Pribalkh., Kyz.-Kum, Upp. Turkm., Amu-Dar., Syr-Dar., Pam.-Al., Tyan'-Shan, Gen. Distr.: East. Medit., Balk.-As. Min., Arm.-Kurd., Iran, Dzung. -Kashg. Described from Africa. Type in Germany.

ECONOMIC IMPORTANCE. Readily eaten by livestock, but rarely occurring in large quantity.

2. *S. calycinus* (L.) Duv.-Jouve in Billot Annot. (1855) 289. -Festuca calycina L. Amoen. acad. III (1756) 400. -Schismus marginatus P. B. Agrost. (1812) 177; Griseb. in Ldb. Fl. Ross. IV, 403. -

366 Ic.: P. B. Agrost. (1812) tab. XV, fig. 4. -Exs.: Herb. Fl. Cauc. No 110. Annual. Plants 5-25 cm tall, tufted; culms numerous, slender, glabrous; leaves narrowly linear, more or less involute; ligule ciliate. Panicle oblong, to 3.5 cm long, contracted; spikelets ca. 6 mm long, 5-8-flowered, pale green; glumes lanceolate, keeled, hyaline-margined; lemmas 2 mm long, covered with short hairs, bifid at the apex down 1/5 of its length, with nondivergent lobes and with or without a short mucro in the notch. April-May. (Plate XXVII, Figure 21, a, b).

* From Greek schismos - crack, referring to the bifid upper part of lemma.

Dry sandy places. -Caucasus: East. and South. Transcauc.; Centr. Asia: Kara-Kum, Upp. Turkm. Gen. Distr.: Medit., Balk. -As. Min. Described from Spain. Type in London.

3. *S. minutus* (Hoffm.) Roem. et Schult. Syst. II, (1817) 584; Griseb. in Ldb. Fl. Ross. IV, 403. -*Festuca minuta* Hoffm. in Comm. Soc. Phys. Mosc. I (1808) 43; Stev. ex M. B. Fl. taur.-cauc. I (1808) 70. -Ic.: Kunth, Enum. pl. I, 2. (1835) tab. XXIII, fig. 3.

Annual. Plants 10-15 cm tall, tufted; culms numerous, slender, glabrous; leaves narrowly linear, more or less involute; ligule ciliate. Panicle oblong, 2-3 cm long, contracted; spikelets ca. 7 mm long, 6-7-flowered, light green; glumes long-acuminate, keeled, hyaline-margined; lemmas ca. 2 mm long, covered with rather long hairs, lobed at the apex down 1/4 of its length, the awn in the incision as long as the lobes. April.

Sandy places. -Caucasus: East. Transcauc.; Centr. Asia: recorded for Pribalkh. [between Tentek and Urta-Terekhty and by the river Tulabulakh (Krylov)]. Endemic. Described from Gandzha. Type in Leningrad.

Genus 167. POA* L.

L. Gen. pl. ed. 1 (1737) 20.

Inflorescence a panicle. Spikelets 2-many-flowered, ovate-lanceolate. Glumes acute, 1-3-nerved, keeled. Lemma and palea membranaceous on the margin, always awnless; lemmas 3-5-nerved, keeled, with a varying amount of woolly web on the back and at base, or glabrous; palea hyaline, 2-keeled. Lodicules obtuse or serrulate. Caryopsis oblong, subtrigonal, falling together with lemma and palea.

ECONOMIC IMPORTANCE. As regards their feed quality, all blue-grasses may be classified as good, rarely fair, forage plants, particularly valuable for pasturage.

- | | |
|---|----------------------------------|
| 1. Culms bulbous at base | 2. |
| + Culm base not bulbous | 8. |
| 2. Lemmas always webbed at the base | 1. <i>P. bulbosa</i> L. |
| + Lemmas never webbed at the base | 3. |
| 3. Lemmas entirely glabrous | 5. |
| + Lemmas glabrous, scabrous on the keel and lateral nerves; occurring only in the Caucasus | 8. <i>P. densa</i> Troitzky. |
| + Lemmas more or less pubescent on the keel and lateral nerves .. | 4. |
| 4. Plants not exceeding 20 cm in height; leaves 0.5-1 mm broad; panicle 1-4 cm long, contracted | 7. <i>P. sinaica</i> Steud. |
| + Plants 35-60 cm tall; leaves to 2.5 mm broad; panicle 5-10 cm long | 4. <i>P. Nevskii</i> Roshev. |
| 5. Plants 2-3.5 cm tall | 6. <i>P. dshilgensis</i> Roshev. |
| + Plants 20-70 cm tall | 6. |
| 6. Plants 35-70 cm tall, with a loose, oblong or pyramidal panicle | 2. <i>P. bactriana</i> Roshev. |

* From Greek *pos* - grass, especially a fodder grass, as the name of the plant was first employed by Linnaeus.

- + Plants 14-35 cm tall 7.
7. Culms slightly bulbous. Panicle open, loose, with few spikelets, short; branches more or less straight-spreading, glabrous 5. *P. Zaprjagajevi* Ovcz.
- + Culms markedly bulbous. Panicle compact, many-flowered, rather elongate 3. *P. glabriflora* Roshev.
- 8(1). Lemmas distinctly 5-nerved 9.
- + Lemmas obscurely 5-nerved 46.
9. Lemmas not webbed at the base 10.
- + Lemmas webbed at the base 18.
10. Lemmas finely ciliate-pubescent on the keel and lateral nerves 11.
- + Lemmas naked on the keel and lateral nerves 12.
11. Annual or biennial plants, with spikelets ca. 3 mm long 9. *P. annua* L.
- + Perennial plants; spikelets ca. 4 mm long 10. *P. supina* Schrad.
12. Leaves long-acuminate, 6-9 mm broad 13.
- + Leaves not more than 5 mm broad 14.
13. Panicle dense, contracted; spikelets 6-9 mm long 13. *P. iberica* Fisch. et Mey.
- + Panicle loose, open at anthesis; spikelets ca. 6 mm long 14. *P. bakuensis* Litw.
14. Leaves narrowly linear, to 2 mm broad, often setaceous-involute. Caucasian plants 15.
- + Leaves 2-5 mm broad, usually flat. Plants of central Asia 16.
- 368 15. Rather compactly tufted; not stoloniferous 16. *P. longifolia* Trin.
- + Not tufted; stoloniferous 15. *P. Meyeri* Trin.
16. Panicle narrow, contracted, short-branched, sublinear 18. *P. bucharica* Roshev.
- + Panicle oblong or pyramidal 17.
17. Ligule naked; rachilla glabrous or short-pilose 17. *P. insignis* Litw.
- + Ligule naked; rachilla glabrous 12. *P. sibirica* Roshev.
- 18(9). Lemmas perfectly glabrous on the internerves 19.
- + Lemmas pubescent on the internerves 42.
19. Keel and lateral nerves perfectly glabrous 20.
- + Keel and lateral nerves more or less ciliate-pubescent 22.
20. Spikelets 8-9 mm long; lemmas scaberrulous due to minute stiff hairs 20. *M. Chaixii* Vill.
- + Spikelets to 7 mm long; lemmas glabrous, smooth 21.
21. Glumes with short, stiff cilia on the keel 19. *P. remota* Forsk.
- + Glumes with a naked keel 21. *P. hybrida* Gaud.
22. Spikelets large, ca. 6-7 mm long. Plants of eastern Siberia and the Far East 38.
- + Spikelets rarely exceeding 5 mm in length 23. *P. silvicola* Guss.
23. Rhizomes moniliform 24.
- + Rhizomes not moniliform 25.
24. Spikelets small, ca. 3 mm long 27.
- + Spikelets larger, 3-5 mm long 27.

25. Ligule long, pointed, to 5 mm long 22. *P. trivialis* L.
 + Ligule not exceeding 2.5 mm in length 26.
26. Plants strongly branched at the base; occurring only in the Caucasus 24. *P. Woronowii* Roshev.
 + Plants almost unbranched at the base; occurring in eastern Siberia 34. *P. sabulosa* Turcz.
27. Lemmas almost webless at the base ... 25. *P. ircutica* Roshev.
 + Lemmas always considerably webbed at the base 28.
28. Panicle narrow, contracted, 7-8 cm long and 1.5 cm broad, with short branches 37. *P. ochotensis* Trin.
 + Panicle oblong or pyramidal 29.
- 369 29. The entire plant pruinose 33. *P. pruinosa* Korot.
 + Plants not pruinose 30.
30. Lemmas almost destitute of pubescence on the nerves 35. *P. subglabriflora* Roshev.
 + Lemmas always with distinctly pubescent nerves 31.
31. Culms leafy up to the inflorescence; leaves sparsely puberulent on the surface, becoming glabrous 31. *P. pinegensis* Roshev.
 + Culms usually leafless in upper part; leaf blades glabrous on both sides 32.
32. Panicle large, 15-25 cm long, slender, delicate, more or less nodding 36. *P. ussuriensis* Roshev.
 + Panicle usually not exceeding 10-15 cm in length, erect 33.
33. Forming loose tufts, consisting of numerous culms 34.
 + Culms solitary or few 35.
34. Inflorescence branches smooth; spikelets not pruinose 32. *P. sajanensis* Roshev.
 + Inflorescence branches prominently scabrous; spikelets always pruinose; rhizome thin, creeping 29. *P. irrigata* Lindm.
35. All leaves, or at least those of the innovations, setaceous-involute 27. *P. angustifolia* L.
 + Leaves flat or folded, not setaceous 36.
36. Culms solitary, flattened in lower part; panicle more or less pyramidal 28. *P. turfosa* Litw.
 + Culms usually gregarious, not flattened; panicle usually oblong. . 37.
37. Plants with long, arcuately ascending stolons, not tufted; panicle somewhat contracted, narrowly oblong; spikelets usually not exceeding 3.5 mm 30. *P. alpigena* (Fr.) Lindm.
 + Plants with rather short stolons, tufted; panicle oblong or pyramidal; spikelets usually 3.5-6 mm long 26. *P. pratensis* L.
- 38(22). Lemmas long-ciliate-pubescent on the keel and marginal nerves 39.
 + Lemmas with ciliate pubescence of moderate frequency and density on the keel and marginal nerves. Mainly plants of eastern Siberia... 40.
 ++ Lemmas with almost naked keel and lateral nerves. Occurring only in the Far East 43. *P. radula* Fr. et Sav.
- 370 39. Culms 10-25 cm tall; panicle fairly compact, 2-5 cm long. Occurring in western Sayany 41. *P. Mariae* Reverd.
 + Culms 50-80 (-100) cm tall; panicle open, 10-15 cm long. Occurring only in Kamchatka 42. *P. penicillata* Kom.
40. Panicle to 15 cm long; culms scabrous below the inflorescence 38. *P. urjanchaica* Roshev.

- + Panicle 15-25 cm long; culms smooth below the inflorescence ... 41.
- 41. Glumes narrowly lanceolate; panicle branches to 8 mm long 39. *P. angustiglumis* Roshev.
- + Glumes broadly lanceolate; panicle branches to 12 mm long. Occur-
ring only in the former Irkutskaya Guberniya 40. *P. Maydellii* Roshev.
- 42(18). Spikelets small, not exceeding 5 mm in length; ligule 1-2 mm
long. Occurring only in the European part the U.S.S.R. 71. *P. petschorica* Roshev.
- + Spikelets large, 5-8 mm long; ligule to 5 mm long. Occurring only
in eastern Siberia and in the Far East. 43.
- 43. Glumes large, attaining 3/4 the length of spikelet 102. *P. macrocalyx* Trautv. et Mey.
- + Glumes always much shorter than the spikelet 44.
- 44. Large plants, 40-80 cm tall. Panicle 10-15 cm long 101. *P. trivialiformis* Kom.
- + Plants not exceeding 40 cm in height. Panicle to 10 cm long 45.
- 45. Tufts large. Occurring only in Irkutskii Raion 104. *P. Smirnowii* Roshev.
- + Tufts small. Occurring in Kamchatka and in Chukotskii Peninsula, ..
..... 97. *P. Komarovii* Roshev.
- 46(8). Lemmas webless at the base 47.
- + Lemmas webbed at base 70.
- 47. Lemmas glabrous on the interneaves 48.
- + Lemmas pubescent on the internerves 67.
- 48. Lemmas glabrous on the nerves 49.
- + Lemma pubescent on the nerves 53.
- 49. A large plant, 45-120 cm tall; panicle broadly pyramidal, 15-25 cm
long and 10-25 cm broad. A Siberian plant 106. *P. subfastigiata* Trin.
- 371 + Plants not exceeding 40 cm in height. Panicle 3-10 cm long. Central
Asiatic plants 50.
- 50. Keels of palea glabrous. Loosely tufted plants 88. *P. karateginensis* Roshev.
- + Keels of palea ciliate only in upper part. Compactly tufted plants ...
..... 89. *P. Gorbunovi* Ovcz.
- + Keels of palea short-ciliate in lower part. Compactly tufted plants 51.
- 51. Plants 15-40 cm tall; leaves flat, to 2 mm broad. Spikelets 6-8(9) mm
long, 4-6-flowered 52.
- + Plants 10-15 cm tall, forming very compact tufts. Leaves narrowly
linear, often involute, 1-1.5 mm broad. Spikelets to 5 mm long, 3-4-
flowered. 93. *P. laudanensis* Roshev.
- 52. Culms thickened at the base due to firm sheaths of dead leaves. Leaves
to 2 mm broad. Panicle loose 86. *P. hissarica* Roshev.
- + Culms not thickened at the base; sheaths of dead leaves thin, purple-
tinged. Panicle oblong, contracted, rather compact 87. *P. acuminata* Ovcz.
- 53(48). Culms thick, to 3 mm in diameter; leaves stiff, to 5 mm broad
..... 105. *P. tibetica* Munro.
- + Culms slender, to 1 mm in diameter; leaves soft, narrow 54.

54. Leaves 0.3-0.5 mm broad, subfiliform. Occurring only in northern Caucasus 77. *P. naltchikensis* Roshev.
 + Leaves 1 mm broad or broader, not threadlike 55.
55. Lemmas faintly pubescent on the nerves, glabrescent 56.
 + Lemma always distinctly pubescent on the nerves 59.
56. Culms prominently scabrous below the inflorescence. Steppe and mountain-steppe plants 57.
 + Culms smooth below the inflorescence. Alpine and tundra plants, . . . 58.
57. Culms leafless above; spikelets lanceolate, to 4.5 mm long. Occurring exclusively in Central Asia 75. *P. Alberti* Rgl.
 + Culm leaves always strongly spreading; spikelets more or less cuneate, 5-6 mm long 65. *P. sterilis* M.B.
58. Panicle containing few spikelets, pyramidal. Occurring in the alpine zone of the Caucasus 76. *P. caucasica* Trin.
 + Panicle contracted, dense. Occurring only in the Far East 80. *P. udensis* Trautv. et Mey.
- ++ Panicle containing few spikelets, narrow; culm very leafy. Occurring only in Pamir. 94. *P. tremuloides* Litw.
- 59(55). Spikelets broadly lanceolate. High-mountain plants 60.
- 372 + Spikelets lanceolate. Plants not mountainous or at most submontane 65.
60. Glumes broadly ovate, short-pointed at the summit 73. *P. alpina* L.
 + Glumes lanceolate, not pointed at the summit 61.
61. Culms smooth, glabrous 62.
 + Culms always more or less scabrous, especially in upper part . . . 64.
62. Plants 4-8 (-10) cm tall, forming very compact but small tufts. Lemmas minutely hirtellous on the keel and lateral nerves 63.
 + Plants 22-42 cm tall, with abundant, stout sheaths of dead leaves at base. Lemmas hirsute on the keel and marginal nerves. 83. *P. dshungarica* Roshev.
63. Panicle with few spikelets, open; spikelets not exceeding 4 mm in length. Occurring only in Sayany Mountains 78. *P. pseudoabbreviata* Roshev.
 + Panicle many-flowered, dense; spikelets 4-5 mm long. Occurring only in Pamir-Alai 92. *P. densissima* Roshev.
64. Plants 14-18 cm tall. Spikelets grayish-tawny-purple or grayish-purple, 4-5 mm long, 3-4-flowered 90. *P. Litzinowiana* Ovcz.
 + Plants to 35 cm tall. Spikelets motley-colored, purplish, 6-7 mm long, 5-7-flowered. Lemmas with a broad, membranaceous fringe 91. *P. marginata* Ovcz.
- 65(59). Panicle contracted, dense; ligule 2-2.5 mm long. Occurring only in Tien Shan 96. *P. Fedtschenkoii* Roshev.
 + Panicle loose; ligule 0.5-1 mm long 66.
66. Spikelets rhomboidal, 7-8-flowered. Occurring only in Western Transcaucasia 66. *P. rhomboidea* Roshev.
 + Spikelets lanceolate, 2-5-flowered. Occurring in the arctic region 79. *P. Tanfiljewi* Roshev.
- 67(47). Culms 7-10 cm tall. Arctic plants 74. *P. abbreviata* R. Br.

- + Plants not arctic, at least 15 cm tall 68.
- 68. Large plants, to 1 m tall; leaves to 1 cm broad. Only in the Far East 107. *P. eminens* Presl.
- + Smaller plants, not exceeding 50 cm in height; leaves to 4 mm broad 69.
- 69. Culms prominently scabrous below the inflorescence; panicle narrow, contracted, sublinear 63. *P. Reverdattoi* Roshev.
- + Culms smooth below the inflorescence; panicle loose, oblong 95. *P. Lipskyi* Roshev.
- 373 70(46). Lemmas glabrous on the internerves 71.
- + Lemmas pubescent on the internerves 96.
- 71. Panicle with a linear, hyaline bract, 3-4 mm long, at the base 98. *P. bracteosa* Kom.
- + Panicle without a hyaline bract at base 72.
- 72. Culm flattened, bluntly 2-angled; leaf sheaths keeled 64. *P. compressa* L.
- + Culms terete; leaf sheaths not keeled 73.
- 73. Ligule very short, not exceeding 1 mm, or lacking 74.
- + Ligule 1-5 mm long 76.
- 74. Ligule lacking or obsolete. A forest plant .. 52. *P. nemoralis* L.
- + Ligule 0.5-1 mm long 75.
- 75. Plant with underground shoots, to 40 cm tall, forming rather compact clumps 46. *P. glauca* Vahl.
- + Plant without underground shoots, ca. 20 cm tall, forming loose tufts 89. *P. Soczawae* Roshev.
- 76. Culms scantily leafy, always scabrous below the inflorescence; leaves usually setaceous or folded, narrow. Steppe or mountain-steppe plants 77.
- + Culms leafy, always smooth below the inflorescence; leaves flat, rarely folded. Meadow, mountain-meadow, or alpine plants 87.
- 77. Culms very strongly scabrous below the inflorescence; panicle pyramidal or rather open. Plants of the western part of Ukraine 78.
- + Culm less scabrous or almost smooth; panicle narrow, contracted, rarely somewhat open. Steppes of the entire Union 79.
- 78. Panicle large, to 18 cm long; spikelets lanceolate-acuminate, 6-8 mm long 48. *P. versicolor* Bess.
- + Panicle 5-10 cm long; spikelets cuneate-lanceolate 47. *P. podolica* Blocki.
- 79. Panicle somewhat open, with numerous spikelets. Lemmas glabrescent 60. *P. transbaicalica* Roshev.
- + Panicle always contracted, with rather short branches 80.
- 80. Panicle branches less than 1 cm long; panicle narrow, 1-1.5 cm across. Far Eastern plants 62. *P. sphondylodes* Trin.
- + Panicle branches 2-3 cm long; panicle broader 81.
- 81. Lemmas narrowly acuminate. Occurring only in Altai 57. *P. attenuata* Trin.
- + Lemmas lanceolate 82.
- 82. Culms quite smooth, glabrous 55. *P. glauciculmis* Ovcz.
- 374 + Culms scabrous, at least in upper part 83.
- 83. Culms 30-60 cm tall 84.
- + Culms 8-30 cm tall 85.

84. Culms leafy nearly up to the top; panicles 8-15 cm long. Central Asiatic plants. 54. *P. relaxa* Ovcz.
 + Culms almost leafless in upper part; panicles 2-6 cm long. A plant of Eastern Siberia 58. *P. botryoides* Trin.
85. Culms coarsely scabrous below the inflorescence. Occurring only in Transcaucasia. 56. *P. araratica* Trautv.
 + Culm scaberrulous or nearly smooth below the inflorescence 86.
86. Plants 8-20 cm tall. Panicles short-branched 59. *P. dahurica* Trin.
 + Plants to 30 cm tall. Panicle branches to 4 cm long. 53. *P. stepposa* (Kryl.) Roshev.
- 87(76). Culms slender, weak, abundantly leafy. Panicles more or less nodding. Occurring in southern Transcaucasia. 51. *P. masenderana* Freyn et Sint.
 + Culms rather stout. Panicles erect 88.
88. Spikelets broadly lanceolate or circular. Alpine plants of Pamir and Tien Shan 89.
 + Spikelets lanceolate or narrowly lanceolate 90.
89. Spikelets large, 5-6 mm long, 3-4-flowered 81. *P. pamirica* (Litw.) Roshev.
 + Spikelets small, 3.5-4 mm long, 2-3-flowered 82. *P. calliopsis* Litw.
90. Lemmas copiously webbed at the base. Plants of arctic Siberia 91.
 + Lemmas scantily webbed at the base. Plants not arctic 92.
91. Plants not exceeding 15 cm in height. Spikelets to 5 mm long 68. *P. taimyrensis* Roshev.
 + Plants 20-30 cm tall. Spikelets 5-7 mm long 67. *P. lanatiflora* Roshev.
92. Spikelets large, 5-8 mm long 93.
 + Spikelets not exceeding 5 mm in length. 94.
93. Culms and leaves rather stiff; lemmas rather long-pubescent on the keel and lateral nerves. Occurring only in Kol'skii Peninsula. 45. *P. Ganeschini* Roshev.
 + Culms and leaves rather soft, delicate. Lemmas puberulent on the keel and lateral nerves. Occurring only in Kamchatka. 11. *P. nivicola* Kom.
- 375 94. Inflorescence rather small, 1.5-4 cm long and 4-10 mm broad, contracted and very narrow. Arcto-alpine plants, 8-15 cm tall 50. *P. tristis* Trin.
 + Inflorescence broader, usually open 95.
95. Plants 10-30 cm tall; cauline leaves much longer than basal leaves. Plants of mountain meadows 49. *P. altaica* Trin.
 + Plants 25-80 cm tall; cauline leaves not longer than basal leaves. Plants of wet meadows 44. *P. palustris* L.
- 96(70). Culm rigid, rather scabrous, leafless in the upper part; panicles narrow, contracted. Steppe plants 61. *P. argunensis* Roshev.
 + Culms smooth, rather leafy; panicles pyramidal or oblong. A plant of wet places 97.
97. Underground shoots long 70. *P. arctica* R.Br.
 + Underground shoots lacking or short 98.
98. Spikelets 4-5 mm long. Arctic plants 72. *P. Tolmatchewii* Roshev.

- + Spikelets 5-8 mm long. Not arctic 99.
- 99. Culms 30-60 cm tall; panicles 11-15 cm long 100. *P. platyantha* Mom.
- + Culms low, rarely exceeding 30 cm in height. Panicles to 10 cm long 100.
- 100. Pubescence of lemmas long, clearly visible with the naked eye 103. *P. petraea* Trin.
- + Pubescence of lemmas short, distinctly visible only with the aid of a magnifier 101.
- 101. Panicle 3-5 cm long, with branches to 2 cm long; spikelets lanceolate. Occurring only in Tien Shan 85. *P. bedeliensis* Litw.
- + Panicle 5-10 cm long, with branches to 4 cm long. Spikelets rather broad 102.
- 102. Panicle many-flowered; spikelets rounded, their breadth exceeding the length in anthesis, flat. Occurring in Kamchatka 99. *P. malacantha* Kom.
- + Panicle few-flowered; spikelets rather broadly lanceolate, always narrower than long. Occurring in the high-mountain regions of Central Asia 84. *P. disiecta* Ovcz.

Series 1. *Bulbosae* Roshev. - *Bolbophorum* Asch. et Gr. Syn. II (1900) 391 ex parte. - Culms bulbous at the base. Plants of steppes and dry mountain slopes. Occurring all over the south-steppe and desert zones of the U.S.S.R.

- 376 1. *P. bulbosa* L. Sp. pl. (1753) 70; Griseb. in Ldb. Fl. Ross. IV, 370; Shmal'g. Fl. II, 655. - Ic.: Rechb. Ic. Fl. Germ. I tab. 81, fig. 1619, 1620. - Exs.: HFR No 848 (var. *vivipara*).

Perennial. Tufts small; roots thin, fibrous; culms 10-30 cm tall, erect, glabrous, leafless in upper part, bulbous at the base due to thickened sheaths of radical leaves; leaves narrowly linear, more or less involute, scabrous on the margin; ligules to 3.5 mm long. Panicles oblong, to 6 cm long, rather dense, more rarely open (f. *patens* Roshev.), with short, scabrous branches; spikelets to 6 mm long, 4-7-flowered, green or more or less purple, very often forming proliferous buds which represent a modified apex of the spikelet, converted into a bulblet resembling the basal bulblets, but smaller (var. *vivipara* Koeler); glumes broadly ovate, with slender tips; lemmas obscurely nerved, pubescent on the keel and marginal nerves, with a tuft of web at the base. May-July. (Plate XXVIII, Figures 1, a, b, 1a, a, b).

Steppes, sands, and dry slopes. - European part: Lad. - Il'm. (introd.), Upp. Volg., Upp. Dnep., Mid. Dnep., Volg. Don, Zavolzh., Prichern., Crimea, Low. Don, Low. Vog.; Caucasus: all regions; West. Siberia: Upp. Tob., Irt., Alt.; Centr. Asia: all regions. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk. - As. Min., Arm. - Kurd., Iran. Ind. - Him., Dzhung. - Kashg. Described from southern Europe. Type in London.

ECONOMIC IMPORTANCE. Under the conditions of Central Asia it plays an important role in spring feeding. One of the most valuable early pasture plants; livestock emaciated after the winter improves on it rapidly. Its yield of herbage amounts to from 3-8 centners per hectare. Readily eaten by all kinds of livestock, except camels.

2. *P. bactriana* Roshev. in Not. Syst. Herb. Horti Petrop. IV (1923)
93. - *P. palustris* var. *leiantha* Hack. in herb.

Perennial. Occasionally tufted; culms 35-70 cm tall, bulbous at the base, more or less erect, smooth, leafy; leaves narrowly linear, 1-3.5 mm broad, flat or involute, rather scabrous; ligules 2-4 mm long. Panicles many-flowered, 5-18 cm long and 2-4 cm broad, rather loose, oblong or pyramidal, the prominently scabrous branches 2-6 cm long; spikelets 4-6 mm long, 3-7-flowered, whitish-green, more rarely variegated; glumes unequal; lemmas obscurely nerved, quite glabrous, not webbed. May-June. (Plate XXVIII, Figure 2, a, b).

Mountain slopes and ravines. -Centr. Asia: Syr-Dar., Pam.-Al. Endemic. Described from Uzbekistan. Type in Leningrad.

3. *P. glabriflora* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

377 Perennial. Tufts small, rather compact; culms 20-35 cm tall, bulbous at the base, erect, glabrous, smooth; leaves narrowly linear, 1-1.5 mm broad, more or less scabrous; basal leaves setaceous-involute, cauline leaves more or less folded; ligules to 3.5 mm long. Panicles oblong-elliptic, dense, many-flowered, 2-4 (-6) cm long, with prominently scabrous branches to 1 cm long; spikelets oblong-ovate, to 6 mm long, 4-8-flowered, green or more or less purple; glumes narrowly lanceolate, somewhat unequal; lemmas obscurely nerved, quite glabrous, not webbed. May-July. (Plate XXVIII, Figure 4).

Dry steppe slopes, ascending up to the snow line in the mountains. -Centr. Asia: Syr-Dar., Pam.-Al. Endemic. Described from Uzbekistan. Type in Leningrad.

4. *P. Nevskii* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

Perennial. Tufts loose; culms 35-60 cm tall, more or less erect, bulbous at the base, glabrous, smooth; leaves narrowly linear, to 2-5 mm broad, flat or more or less folded, on sterile shoots much narrower, sub-setaceous; ligules 1-4 mm long. Panicles many-flowered, 5-10 cm long and 1-3.5 cm broad, more or less oblong, with branches to 3 cm long; spikelets 4-5 mm long, 3-5-flowered, green or motley-tinged; glumes rather narrowly lanceolate, the upper somewhat larger than the lower; lemmas obscurely nerved, glabrous except the ciliate keel, more rarely glabrescent all over (f. *subglabra* Roshev), without a web. May-June. (Plate XXVIII, Figure 3).

Mountain slopes. -Centr. Asia: Pam.-Al. Endemic. Described from Kugitang Mountains. Type in Leningrad.

5. *P. Zaprjagajevi* Ovcz. in Izv. Tadzhikist. Bazy Akad. Nauk (Rep. Tadzhikist. Base of the Acad. Sci.) I, 1 (1933) 14.

Perennial. Culms 14-30 cm tall, solitary, with small bulbs at the base; leaves flat, 1-2.2 mm broad, scaberulous on the lower surface; ligules to 3 mm long. Panicles loose, 2.5-4 cm long, with rather spreading branches; spikelets to 4 mm long, 4-flowered, round-elliptical or lance-elliptical; lower glume lanceolate, acute; upper glume broadly ovate, with a naked or short-ciliate keel; lemmas glabrous ovate-lanceolate, usually dark-purple, golden-hyaline on the margin, obscurely nerved, without a web at the base. June. (Plate XXVIII, Figure 7, a, b).

Mountain slopes, at the altitude of 3,000 m. -Centr. Asia: Pam.-Al. Endemic. Described from Tadzhikistan, Shurabadskii Raion. Type in Leningrad.

6. *P. dzhilgensis* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

Perennial. Densely tufted; culms 2-3.5 cm tall, glabrous, smooth, surrounded at the base with somewhat thickened sheaths of basal leaves which
378 are broadly hyaline on the margin; leaves narrowly linear, 0.5-2 cm long and ca. 0.5 mm broad, setaceous-involute, more or less arched, scabrous; ligules to 3 mm long, scarious, bilobed, pointed. Panicles dense, contracted, 1-1.5 cm long, oblong, short-branched; spikelets ovate, ca. 4 mm long and 2-3 mm broad, 3-5-flowered, more or less purple, often proliferous; glumes subequal, hyaline-margined; lemmas obscurely nerved, broadly lanceolate, entirely glabrous, not webbed. April. (Plate XXVIII, Figure 5).

Dry, sandy, precipitous slopes. -Centr. Asia: Syr-Dar. Endemic. Described from the neighborhood of Dzhilga station (to the north of Tashkent, according to collections of B. A. Fedchenko and E. G. Bobrov, 1926). Type in Leningrad.

7. *P. sinaica* Steud. Syn. pl. gram. (1855) 256.

Perennial. Densely tufted; culms 7-20 cm tall, bulbous at base, slender, glabrous, smooth; leaves narrowly linear, ca. 0.5-1 mm broad, basal leaves numerous, short, setaceous-involute, cauline leaves folded, more or less scabrous; ligules to 5 mm long, bifid, scarious (conspicuous on basal leaves). Panicles oblong, 1-4 cm long, contracted, short-branched; spikelets 3-6-flowered, ovate, glaucous-green or somewhat purplish; glumes about equal, broadly lanceolate; lemmas obscurely nerved, scantily pilose on the keel and lateral nerves, more rarely glabrescent on the keel and nerves, glabrous elsewhere, not webbed. April-May. (Plate XXVIII, Figure 6, a, b).

Dry stony slopes of the middle mountain zone. -Caucasus: East. and South. Transcauc. Gen. Distr.: East. Medit., Arm.-Kurd., Iran. Described from Mount Sinai.

8. *P. densa* Troitzky Bull. Jard. Bot. Princ. XXVII (1928) 619. -Ic.: Troitzky, l. c.

Perennial. Tufted; rhizome short-creeping; culms 20-40 (-60) cm tall, few, slender, erect, bulbous at the base; basal leaves 5-8 cm long and 1.5 mm broad, flat, folded when young, cauline leaves 4-6 cm long and 2-3 mm broad. Panicles contracted, dense, elongate-elliptical, 4-7 cm long, short-branched; spikelets lanceolate, 3-5 mm long and 2-3 mm broad; 2-4-flowered; glumes acute, prominently scabrous on the keel; lemmas obscurely nerved, glabrous, scabrous only on the nerves, not webbed. June-July. (Plate XXVIII, Figure 8, a, b).

Endemic. Described from Georgia (Tiflisskii Raion, Garedzhinskaya Steppe, 17 June 1927, N. Troitskii). Type in Tiflis, cotype in Leningrad.

Series 2. *Annuae* Roshev. -Glumes unequal, the lower 1-nerved, the upper 3-nerved. Web lacking. Occurring everywhere, except polar regions and deserts.

379 9. *P. annua* L. Sp. pl. (1753) 68; Griseb. in Ldb. Fl. Ross. IV, 377; Shmal'g. Fl. II, 635. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 32, fig. 1621. -Exs.: Kneucker., Gram. exsic. No 352.

Annual or biennial. Tufted, with fibrous roots, sometimes stoloniferous (var. *reptans* Hausskn.); culms 10-30 cm tall, ascending, smooth, very often weak, long-exserted (var. *aquatica* Asch. -near water); leaves narrowly linear, flat, smooth; lower ligules obtuse, the upper elongate.

Panicles pyramidal, to 7 cm long, open; spikelets 3-4 mm long, 3-7-flowered, more rarely 1-3-flowered (var. *pauciflora* Pick.), oblong, green or more or less purple; glumes subobtusely, hyaline-margined, the lower 1-nerved, the upper 3-nerved; lemmas subobtusely distinctly nerved, pubescent only on the lower part of the nerves, not webbed. May-September. (Plate XXVIII, Figure 9).

Meadows, fields, weedy places, and roads. -European part: all regions; Caucasus: all regions; East Siberia: all regions; Far East: all regions; Centr. Asia: Pribalkh., Aral, -Casp., Dzung.-Tarb., Upp. Turkm., Pam. -Al., Tyan'-Shan. Gen. Distr.: occurs everywhere, except polar and alpine regions and deserts. Described from Europe. Type in London.

NOTE. Very modest in its requirements, grows well everywhere, resistant to treading, often occurring on roadsides. Distinguished by good fodder quality, but unsuitable for hay-cutting meadows on account of its low growth. A good pasture plant. Considered as a troublesome weed in gardens. One of the best plants for lawn establishment.

10. *P. supina* Schrad. Fl. Germ. I (1806) 289. -*Poa annua* var. *varia* Gaud. Fl. Helv. I (1828) 243. -*Poa annua* b. *supina* Rchb. Fl. Germ. exc. (1830) 46. -lc.: Rchb. lc. Fl. Germ. I, tab. 82, fig. 1622. -Exs.: Fl. Exs. Aust. Hung. No 3965.

Perennial. Tufted; culms 5-25 cm tall, geniculate-ascending, glabrous, smooth; leaves linear, acuminate, flat, glabrous, smooth; ligules to 1.5 mm long. Panicles contracted, 2-3 cm long; spikelets ca. 4 mm long, oblong-ovoid, 4-5 (-7)-flowered, somewhat expanded at the apex; glumes unequal, hyaline-margined, the lower 1-nerved, the upper 3-nerved; lemmas subobtusely, distinctly nerved, pubescent only on the lower part of the nerves, not webbed. June-August.

Alpine meadows. -Caucasus: recorded for Ciscauc. and West. Transcauc. Gen. Distr.: mountainous parts of Europe. Described from Germany. Type in Munich.

Series 3. *Nivicolae* Roshev. -Culms and leaves slender, soft. Spikelets large, webbed at the base. Plants of the subalpine zone of Kamchatka.

11. *P. nivicola* Kom. in Not. Syst. Herb. Horti Bot. Petrop. V (1924) 147. -*P. flavidula* Kom. l.c., p. 146. -*P. paucispicula* Hult. Fl. Kamtsch. I (1927) 131, non Scribn. et Merr.

380 Perennial. Tufts loose; rhizome creeping; culms 5-20 cm tall, solitary or in small compact tufts, more rarely in loose tufts with abundant foliage (var. *flavidula* (Kom.) Roshev.); leaves narrowly linear, short-acuminate, 1-2 mm broad, light green, flat; ligules ca. 1 mm long. Panicles very loose, few-flowered, 5-7 cm long, with scabrous branches to 4 cm long; spikelets to 7 mm long, lance-elliptical, 3-5-flowered, green or more or less purplish. Glumes lanceolate, subequal; lemmas broadly lanceolate, with membranaceous margins, obscurely nerved, glabrous, puberulent only on the keel and lateral nerves, webbed at base. July-September. (Plate XXVIII, Figure 10).

In alpine meadows and near melting snow, also on river pebbles in the alder forest belt (var. *flavidula* (Kom.) Roshev.). -Far East: Kamch. Endemic. Described from the upper reaches of Gremuchya stream. Type in Leningrad.

Series 4. *Sibiricae* Roshev. -Lemmas always distinctly nerved, entirely glabrous, not webbed. Meadow plants of the northern and eastern part of the forest zone of the U.S.S.R.; in the south occurring only in mountains.

12. *P. sibirica* Roshev. in Bull. Jard. Bot. Petersb. XII (1912) 121; Kryl. Fl. Zap. Sib. II, 277. - *Poa pratensis nudiflora* Ldb. Fl. alt. I (1829) 96; Griseb. in Ldb. Fl. Ross. IV, 380. - *P. trivialis* y altaica Griseb. in Ldb. Fl. Ross. IV (1853) 380.

Perennial. Sometimes tufted, with creeping rhizomes; culms 50-120, more rarely 20-25 (var. *pumila* Roshev.) cm tall, slender, smooth, leafy; leaves linear-acuminate, 2-5 mm broad, flat, rarely subinvolute, with scaberulous sheaths and fairly smooth blades; ligules ca. 1 mm long, obtuse. Panicles 6-18 cm long, pyramidal or oblong, not dense, with rather long branches; spikelets 3.5-6.5 mm long (3.5-4 mm long-var. *micrantha* Roshev.; 5.5-6.5 mm-var. *macrantha* Roshev.), lanceolate, (2) 3-4 (5)-flowered, green (f. *viridis* Roshev.) or dark purple (f. *nigra* Roshev.); glumes narrowly lanceolate, unequal, scabrous on the keel; lemmas distinctly nerved, entirely glabrous, not webbed. June-August. (Plate XXVIII, Figure 11, a, b).

- 383 Meadows, coppices, and forest borders. - European part: Dv.-Pech.; Volg.-Kam. (east. part); West. Siberia: (Northeast. part) Obsk, Irt, Alt.; East. Siberia: all regions; Far East: Ze.-Bur., Ussur, Sakh.; Centr. Asia: Pribalkh., Dzung. - Tarb., Tyan'-Shan. Gen. Distr.: Northern Mongolia. Described from Siberia. Type in Leningrad.

ECONOMIC IMPORTANCE. A good hay-making and pasture plant, especially for cattle.

13. *P. iberica* Fisch. et Mey. in Delect. Sem. Horti Petrop. IX Suppl. (1843) 15. - *P. longifolia* var. *anceps* Somm. et Lev. in A.H.P. XVI (1900) 449.

Perennial. Often tufted; culms 70-150 cm tall, ascending, to 5 mm thick, flattened, 2-angled at the nodes, glabrous, smooth or somewhat scabrous, leafy; leaves long-acuminate, flat, to 8 mm broad, rather prominently scabrous, with sheaths keeled in upper part; ligules to 3 mm long. Panicles 12-22 (-27) cm long, oblong, rather contracted, sometimes interrupted, the prominently scabrous branches to 12 cm long; spikelets 8-9 mm long, 3-4-flowered, green, rarely purplish; glumes unequal, lanceolate; lemmas distinctly nerved, entirely glabrous, scabrous on the keel, not webbed. May-July. (Plate XXVIII, Figure 12, a, b).

Mountain and alpine meadows. - Caucasus: Ciscauc., West., East., and South. Transcauc. Endemic. Described from Transcaucasia (Mount Kadian). Type in Leningrad.

14. *P. bakuensis* Litw. sp. nova in Addenda p. 753.

Perennial. A light green plant; rhizome short-creeping; culms 60-90 cm tall, glabrous, smooth, surrounded at the base by basal leaves, almost leafless above; leaves much longer than the sheaths, flat, to 9 mm broad, gradually narrowed to a point, scaberulous; ligules ca. 1.5 mm long. Panicles loose, open in anthesis, to 16 cm long and 12 cm broad, the scabrous branches to 7 cm long, paired; spikelets ca. 6 mm long, lanceolate, 3-4-flowered, green; glumes narrowly lanceolate, unequal; lemmas distinctly nerved, entirely glabrous, not webbed. June.

Coppices. - Caucasus: East. Transcauc. Endemic. Described from Kussary, Bakinskii Raion (21 June 1899, F. Alekseenko). Type in Leningrad.

15. *P. Meyeri* Trin. nomen nudum in Herb. Ac. Sc. USSR, descrip. nostra in Addenda p. 753. - *Poa angustifolia* f. *nigrescens* Roshev. in Grossg. Fl. Kavk. (Fl. Cauc.) I (1928) 106.



Perennial. Rhizome creeping, stoloniferous; culms 40-80 cm tall, slender, smooth, not flattened, with few culm leaves, but usually with sterile shoots; leaves narrowly linear, to 2 mm broad, with keeled sheaths, smooth, rather flat, on sterile shoots narrow, subsetaceous; ligules ca. 1 mm long. Panicles narrow, contracted, to 9 cm long, with prominently scabrous, 384 erect branches; spikelets 5-7 mm long, 3-5-flowered, greenish or more or less purple; glumes lanceolate, unequal; lemmas distinctly nerved, entirely glabrous, not webbed at the base. June-July.

Very wet meadows. -Caucasus: East. Transcauc., Tal. Endemic. Described from Talysh, subalpine meadows near the village Drish (June 1830, D. Meier). Type in Leningrad.

16. *P. longifolia* Trin. in Bull. Sc. Acad. Petersb. I (1836) 69.; Griseb. in Ldb. Fl. Ross. IV, 880; Shmal'g. Fl., 634.

Perennial. Forming compact tufts; culms 60-120 cm tall, slender, smooth, slightly flattened only at the base; leaves narrowly linear, involute, on sterile shoots very long; ligules short, ca. 1 mm in length. Panicles narrow, contracted, 6-12 cm long, the short, erect branches 2-4 at a node; spikelets 5-7 mm long, 2-3-flowered; glumes narrowly lanceolate, acute, somewhat unequal; lemmas distinctly nerved, entirely glabrous, not webbed at the base. June-July.

Subalpine and alpine meadows. -European part: Crimea; Caucasus: Ciscauc., Dag., West., South., and East. Transcauc. Endemic. Described from Caucasus. Type in Leningrad.

ECONOMIC IMPORTANCE. A fairly good pasture plant. It should be tried under cultivation in alpine and subalpine meadows.

17. *P. insignis* Litw. sp. nova in Addenda p. 753.

Perennial. Rhizome creeping; culms 120 cm tall, glabrous, smooth; leaves linear, flat, to 5 mm broad, cucullate-constricted at the apex, scabrous on the margin, basal leaves 2-5 cm long, leaves of the culm to 15 cm long; ligules obtuse, 1.5 mm long, hairy. Panicle green, ovoid-oblong, branches in verticils of 5, scabrous, spreading; spikelets 4-4.5 mm long, 1-2-flowered; lower glume 1-nerved, ca. 2.25 mm long, lanceolate, hyaline-margined, the upper to 3 mm long, 3-nerved; rachilla scabrous; lemmas ca. 4 mm long, ovate-acute, distinctly 5-nerved, entirely glabrous, scabrous on the keel, not webbed. August.

Deciduous forests. -West. Siberia: Alt. Endemic. Described from Ust'-Kamenogorskii Raion, from Urunkhaika River valley, to the south-east of Marka-Kul' Lake (8 August 1908, A. N. Sedel'nikov). Type in Leningrad.

Explanation to Plate XXVIII

1-*Poa bulbosa* L., a) base of culm, b) spikelet; 1a-*P. bulbosa* L. var. *vivipara* Koeler, a) inflorescence, b) proliferous spikelet; 2-*P. bactriana* Roshev., a) inflorescence, b) spikelet; 3-*Poa Nevskii* Roshev., spikelet; 4-*P. glabriflora* Roshev., spikelet; 5-*P. dzhilgensis* Roshev., general view, spikelet; 6-*P. sinica* Steud., a) inflorescence, b) spikelet; 7-*P. Zaprjagajevi* Ovcz., a) base of culm, b) spikelet; 8-*P. densa* Troitzky, a) base of culm, b) spikelet; 9-*P. annua* L., spikelet; 10-*P. nivicola* Kom., spikelet; 11-*P. sibirica* Roshev., a) spikelet; 12-*P. iberica* Fisch. et Mey., a) inflorescence, b) spikelet; 13-*P. bucharica* Roshev., a) inflorescence, b) spikelet; 14-*P. remota* Forcellis, spikelet; 15-*P. Chaixii* Vill., spikelet; 16-*P. hybrida* Gaud., spikelet; 17-*P. trivialis* L., spikelet; 18-*P. silvicola* Guss., radical part; 19-*P. Woronowii* Roshev., radical part and panicle; 20-*P. circutica* Roshev., a) inflorescence, b) spikelet.

18. *P. bucharica* Roshev. in Not. Syst. Herb. Horti Petrop. IV (1923) 94.

Perennial. Not tufted; roots fibrous; culms 30-60 cm tall, erect, glabrous, smooth; leaves narrowly linear, 1-3 mm broad, flat or subinvolute; ligules to 1 mm long. Panicles many-flowered, 5-10 cm long and 1-3 cm broad, contracted, somewhat interrupted below, branches glabrous, 0.2-1 cm long; spikelets 5-7 mm long, 3-6-flowered, rather dark purple, more rarely green; glumes unequal; lemmas with 5 fairly distinct nerves, entirely glabrous, not webbed. July-August. (Plate XXVIII, Figure 13, a, b).

Mountain slopes, up to 3,500 m altitude. -Centr. Asia: Syr-Dar., Pam. -Al. Endemic. Described from Gissarskii Range. Type in Leningrad.

Series 5. *Triviales* Roshev. -Lemmas always distinctly nerved, entirely glabrous or with puberulent nerves, scantily webbed at the base. Plants of the forest belt and the subalpine mountain zone. All over the U.S.S.R.

19. *P. remota* Forsk., in Linneska Inst. Skrift. I (1807) 1-9, tab. 1; Lindm. in Engl. Bot. Jahrb. XLIV (1910) 36-45, fig. 1-2. -*P. sudetica* var. *remota* Fries. Nov. Fl. succ., ed. 2 (1828) 11; Griseb. in Ldb. Fl. Ross. IV, 380; Shmal'g. Fl. II, 634; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 236. -*Poa quadripedalis* Ehrh. ex Koel. Descr. Gram. (1802) 160. -Exs.: HFR No 298 (sub var.); Pl. Finl. exs. No 476, 477.

Perennial. Rhizome short; culms 60-150 cm tall, erect, fairly smooth, flattened, 2-edged; leaf sheaths scaberulous on the keel and veins; leaves delicate, light green, short-acuminate; ligule 1-3 mm long, obtuse. Panicles open, to 30 cm long, with long, slender, scabrous branches; spikelets ca. 6 mm long, 3-5-flowered, green, rarely somewhat purplish; glumes narrowly lanceolate, prominently scabrous on the keel, the lower shorter than the upper; lemmas 3-5 mm long, with distinct, scabrous nerves, glabrous, the web scant. June-July. (Plate XXVIII, Figure 14).

Wet, marshy meadows and alder thickets. -European part: Kar. -Lap., Dv.-Pech., Lad.-Il'm., Upp. Volg., Volg.-Kam., Upp. Dnep., Mid. Dnep., Volg.-Don, Zavolz', Prichern., Low. Don; Caucasus: recorded for East. Transcauc.; West. Siberia: all regions; Centr. Asia: Dzung. -Tarb. Gen. Distr.: Scand., Centr. Eur. Described from Sweden.

20. *P. Chaixii** Vill. Fl. Delph. ap. Gilib. Syst. pl. Eur. I (1785) 7. -*P. silvatica* Vill. Fl. Dauph. II (1787) 128, tab. III, non Poll. -*Poa sudetica* Haenke Reis. Riesengeb. (1791) 120; Griseb. in Ldb. Fl. Ross. IV, 380. -Ic.: Rechb. Ic. Fl. Germ. I, tab. 90, fig. 1657, 1658. -Exs.: Fl. Gall. et Germ. exs. No 755.

Perennial. Tufted; culms 60-120 cm tall, erect, flattened, 2-edged below, scabrous; leaves 7-10 (-15) mm broad, flat, short-acuminate and terminating in a hooded point, blades and sheaths scaberulous on the margin; ligules ca. 1 mm long. Panicles to 25 cm long, rather spreading; spikelets 8-9 mm long, 4-5-flowered, green, rarely somewhat tinged; glumes narrowly lanceolate, glabrous; lemmas minutely scabrous, distinctly nerved; web lacking or obsolete. May-July. (Plate XXVIII, Figure 15).

* Named for the French botanist D. Chaix (1730-1799), doctor and florist in the Hautes Alpes Department of France.

Forests. - Recorded for the Caucasus. Gen. Distr.: Scand., Centr. and Atlan. Eur., Medit., Balk. -As. Min., Arm. -Kurd. (Lazistan). Described from southern France. Type in Grenoble.

21. *P. hybrida* Gaud. Agrost. Helv. (1811) 215. -*P. sudetica* Y. *hybrida* Griseb. in Ldb. Fl. Ross. IV, 380. -Exs.: Fl. Exs. Austr. -Hung. No 1090.

Perennial. Rhizome short-creeping; culms 60-110 cm tall; culms and sheaths glabrous, smooth; blades long-acuminate, to 5 mm broad, flat; ligules ca. 1 mm long. Panicles to 20 cm long, slightly nodding, ellipsoid, with prominently scabrous branches; spikelets 5-7 mm long, 3-5-flowered, green, rarely somewhat tinged; glumes narrowly lanceolate, unequal, 2-4 mm long. Lemmas distinctly nerved, glabrous, with silvery pubescence only on the keel, scantily webbed at the base. July-August. (Plate XXVIII, Figure 16).

Subalpine and alpine meadows. -Caucasus: Ciscauc., East. Transcauc. Gen. Distr.: Centr. Eur., Balk. -As. Min., Arm. -Kurd. Described from the Alps. Type in Lausanne.

22. *P. trivialis* L. Sp. pl. (1753) 67; Griseb. in Ldb. Fl. Ross. IV, 379; Shmal'g. Fl. II, 634; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 296. -Jc.: Rchb. Ic. Fl. Germ. I, tab. 89, fig. 1653-1655. -Exs.: Kneucker, Gram. exs. No 645.

Perennial. Forming tufts with short underground shoots; culms 20-100 cm tall, erect, scaberulous, slender; leaves linear-acuminate, flat, 1.5-4 mm broad, more rarely to 7 mm (f. *latifolia* Schur), scabrous on the upper surface; leaf sheaths glabrous (var. *glabra* Doell.) or prominently scabrous (var. *stricta* Doell.), keeled in upper part; ligules long, pointed, to 5 mm long. Panicles to 20 cm long, pyramidal or oblong, open, more rarely contracted, with prominently scabrous branches; spikelets 2.5-3.5 mm long, green, rarely more or less tinged (f. *variegata* Roshev.), 2-3-flowered or 1-2-flowered (var. *semineutra* (W. et K.) Griseb.), more rarely 4-5-flowered (var. *multiflora* Rchb.); glumes unequal, scabrous on the keel; lemmas with distinct, prominent nerves, keel and lateral nerves puberulent, web scant. June-July. (Plate XXXVIII, Figure 17).

Wet meadows and borders of water reservoirs, also as a weed. -European part: all regions; Caucasus: all regions; West. Siberia: Ob. region; East. Siberia: Yenisei, Ang. -Sayan.; Far East: Sakhalin (introduced); Centr. Asia: Upp. Turkm., Syr-Dar., Pam. -Al., Tyan-Shan. Gen. Distr.: all Europe, As. Min., Iran, Jap. -Chin. Described from Switzerland. Type in London.

387 ECONOMIC IMPORTANCE. As regards fodder value, somewhat inferior to *Poa pratensis*. Readily eaten by livestock in pasture and in the form of hay. Can be recommended for use in mixtures for pastures with a high moisture content. A plant suitable for grazing, but rather short-lived (5-6 years). Hay yield 15-20 centners per hectare.

23. *P. silvicola* Guss. Enum. Pl. Inar. (1854) 271. -*P. trivialis* var. *silvicola* Roshev. Fl. Yugo-Vost. (Fl. of the Southeast) II (1928) 110. -*P. attica* Freyn., Fl. Istr. (1877) 469 (non Boiss. et Heldr.).

Perennial. Forming small tufts with beaded underground shoots; culms 30-100 cm tall, erect, glabrous, scaberulous; leaves linear-acuminate,

flat, to 5 mm broad, rather scabrous; ligules long, pointed, to 5 mm long. Panicles to 20 cm long, oblong, rather contracted; spikelets 2.5-3 mm long, 2-3-flowered, green, rarely somewhat tinged; glumes narrowly lanceolate, subequal; lemmas prominently nerved, keel and lateral nerves faintly puberulent, web scant. June-July. (Plate XXVIII, Figure 18).

Wet meadows, also as a weed. -European part: Mid. Dnep., Volg. -Don, Crimea, Low. Don; Caucasus: all regions; Centr. Asia: Upp. Turkm., Syr-Dar., Pam. -Al., Tyan'-Shan. Gen. Distr.: Mediterranean. Described from Italy. Type in Naples.

24. *P. Woronowii* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, II (1934).

Perennial. Forming dense tufts with a large number of sterile shoots and few floriferous culms; culms 20-30 cm tall, ascending or often decumbent, glabrous, smooth, leafy; leaves linear-acuminate, 1-2.5 mm long, truncate. Panicles narrow, contracted, ca. 7 cm long and 1-1.5 cm broad, somewhat interrupted, light green; spikelets small, ca. 3 mm long, 2-3-flowered; glumes subequal, narrowly lanceolate; lemmas distinctly nerved, glabrous, only the keel with appressed, inconspicuous silky hairs, web consisting of few long threads. (Plate XXVIII, Figure 19).

Found in a corn field. -Caucasus: West. Transcauc., near Tsebel'da (July 1901, Yu. N. Voronov). Endemic. Described from Abkhaziya. Type in Leningrad.

25. *P. irtutica* Roshev. in Not. Syst. Herb. Horti Bot. Petropol. III (1922) 91.

Perennial. With creeping stolons, not tufted; culms 50-90 cm tall, ascending, glabrous, smooth; leaves linear-acuminate, flat, to 5 (-7) mm broad; ligules obtuse, ca. 2 mm broad. Panicles pyramidal, to 15 cm long, few-flowered; spikelets ca. 5 mm long, 4-flowered, more or less purplish or brownish; glumes unequal, the lower 1-nerved, the upper 3-nerved; lemmas distinctly but not prominently nerved, puberulent on the keel and nerves in lower part, glabrous elsewhere; web obsolete. June-July. (Plate XXVIII, Figure 20, a, b).

388 Alpine and subalpine meadows, up to the upper forest line. East. Siberia: Ang. -Sayan., Daur. Endemic. Described from Baikal, Khamar-Daban. Type in Leningrad.

Series 6. *Pratenses* Roshev. -Spikelets rarely exceeding 5 mm in length. Lemmas always with 5 distinct, more or less pubescent nerves, glabrous, profusely webbed at the base. Meadow plants. All over the Union.

26. *P. pratensis* L. Sp. pl. (1753) 67; Griseb. in Ldb. Fl. Ross. IV, 378; Shmal'g. Fl. II, 635; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 297. -*P. Alberti* var. *biflora* Rgl. in A. H. P. VII (1880) 611 ex parte. -*P. paratunkensis* Kom. in Fedde, Repert. sp. nov. (1914) 162. -*l.c.*: Rchb. *l.c.* Fl. germ. I, tab. 88, fig. 1650-1652. -*Exs.*: Kneucker, Gram. exs. No 766.

Perennial. A stoloniferous plant, sometimes forming fairly dense or loose tufts (f. *foliosa* Roshev. = *P. paratunkensis* Kom.); culms 30-90 cm tall, rarely 10-20 cm (var. *humilis* Griseb.), ascending, smooth; leaves narrowly linear, to 4 mm broad, flat, smooth or scabrous; ligules 0.5-2 mm long, obtuse. Panicles to 20 cm long, oblong or pyramidal, many-flowered, with scabrous branches arranged in fascicles

of 3-5; spikelets ovate, 3.5-6 mm long, 2-5-flowered, green, more rarely purple (f. *variegata* Roshev.); glumes subequal, acute; lemmas lanceolate, with prominent, pubescent nerves, copiously webbed. May-July. (Plate XXIX, Figure 1).

Meadows, fields and forest borders. -Arctic: Arct. Eur. -rarely; European part: all regions; Caucasus: all regions; Siberia: all regions; Far East: all regions; Centr. Asia: Aral.-Casp., Pribalkh., Dzung. -Tarb., Syr-Dar., Pam.-Al., Tyan'-Shan. Gen. Distr.: almost the entire northern temperate zone. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. A low-growing, perennial grass, growing everywhere, but preferring moist, fertile soils. Attains its greatest development in the second and the third year. Gives on the average about 1,600 kg hay per hectare. Both herbage and hay are very nutritious and are eaten readily by all kinds of livestock. Also suitable for pasturage, as it produces much aftergrowth. It is the most important pasture grass in North America and takes second place after timothy in yield value. Ash contains more than 70% $P_2O_5 + K_2O$ (Wehmer).

27. *P. angustifolia* L. Sp. pl. (1753) 89. -*P. pratensis* β *angustifolia* Sm. Fl. Brit. (1800) 105. -Griseb. in Ldb. Fl. Ross. IV, 379; Shmal'g. Fl. II, 635; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 298. -Ic.: Rehb. Ic. Fl. germ. I, tab. 88, fig. 1648. -Exs.: Hayek, Fl. Stir. exs. No 57.

389 Perennial. With a creeping rhizome, tufted; culms 30-60 (-80), more rarely 15-20 (var. *collina* (Schur.) Roshev.) cm tall, ascending, smooth; leaves narrowly linear, ca. 1.5 mm broad, all of them, or at least the basal, setaceous-involute, glabrous, smooth, rarely blades and sheaths more or less pubescent (var. *hirtula* Asch. et Gr.). Panicles (3) 5-10 (15) cm long, rather contracted, oblong, with short, scaberulous branches; spikelets ovate, 3.5-5 mm long, 2-4-flowered, green or purple (f. *variegata* Roshev.); glumes subequal, scabrous on the keel; lemmas with distinct, more or less pubescent nerves, otherwise glabrous, copiously webbed at the base. May-July.

Dry meadows, meadow-steppes, and slopes. -European part: all regions (except Kar.-Lap. and Dv.-Pech.); Caucasus: all regions; West. Siberia: all regions; East. Siberia: all regions; Far East: Kamch., Ze. -Bur., Ussur., Sakh.; Centr. Asia: all regions. Gen. Distr.: almost the entire temperate belt. Described from Europe. Type in London.

NOTE. An exceedingly polymorphous species, within which two fairly distinct (ecological?) races can be distinguished: *Poa setacea* Hoffm. and *Poa strigosa* Hoffm. However, in view of the fact that they have no defined distribution areas and appear to produce transitions towards the typical *Poa angustifolia* L., we do not propose to separate them as fully independent species before a detailed study of all the races of the principal species has been made.

P. setacea Hoffm. Deutsch. Fl., ed. 2, I (1800) 44. -*Poa pratensis* var. *angustifolia* f. *setacea* Roshev. Fl. Yugo-Vostoka (Fl. of the Southeast) II (1928) 111.

Differs from the principal species in the very long, setaceous-convolute basal leaves which considerably exceed half the length of the culm (Plate XXIX, Figure 3).

P. strigosa Hoffm. Deutsch. Fl., ed. 2, I (1800) 44. - *P. pratensis* var. *angustifolia* f. *strigosa* Roshev. Fl. Yugo-Vostoka (Fl. of the Southeast) II (1928) 111. - *P. pratensis* var. *strigosa* Gaud. Agrost. Helv. I (1811) 214; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 298.

Differs from the principal species in the short setaceous-convolute leaves which do not exceed half the length of the culm, and in the leafless upper part of the culm (Plate XXIX, Figure 2)

Both species occur at the same places as *Poa angustifolia* L.

ECONOMIC IMPORTANCE. They are characterized by the same attributes as *Poa pratensis*, but they are somewhat tough and their harvest per hectare is lower.

28. *P. turfosa* Litw. in Sched. ad Herb. Fl. Ross. VIII (1922) 135. - *P. pratensis* var. *anceps* Litw. in Maevsk. Fl. Sr. Ross. (Maevsk. Fl. of Centr. Russia), Ed. 4 (1912) 665. - Exs.: HFR No 2673.

Perennial. Light green or glaucous plants; culms 30-50 cm tall, solitary, distinctly flattened below, glabrous; basal leaves narrowly linear, folded, leaves of the culm flat, to 5 mm broad subobtusely, the upper ones short; ligules 2-3 mm long. Panicles pyramidal, many-flowered, loose, to 10 cm long; spikelets 3-4 mm long, lanceolate, 2-3-flowered, sometimes purplish; glumes unequal, 2.5-3 mm long, lanceolate, scabrous on the keel; lemmas distinctly 5-nerved, ciliate only on the nerves, webbed at the base. June-July.

Mossy bogs. - European part: Kar. - Lap., Lad. - Il'm., Upp. Volg.; East. Siberia: recorded by D. I. Litvinov for Daur. Endemic. Described from the mossy bog of the river Unzha, near the town of Melenki. Type in Leningrad.

29. *P. irrigata* Lindm. in Bot. Not. (1905) 88. - *P. pratensis* var. *rigens* Laest. in Vet. Ak. Handl. (1822) 328. - Ic.: Bot. Not. (1905) 75-80. - Exs.: Pl. Finl. No 478.

Perennial. Stoloniferous plants, with a rather distinct glaucous bloom; culms 20-40 cm tall, more rarely 10-15 cm (f. *brevior* Lindm.) or -60 cm (f. *aucta* Lindm.), solitary, more or less ascending, glabrous; leaves narrowly linear, more or less folded, the radical to 10 cm long, arched, the cauline short, erect; ligules 1-2 mm long, obtuse. Panicles pyramidal, 3-6 cm long, few-flowered; spikelets 5-6.5 mm long, lanceolate, 2-3-flowered, more or less purplish; glumes about equal; 4-5 mm long, acute, prominently scabrous on the keel, always pruinose; lemmas distinctly nerved, ciliate only on the nerves, copiously webbed. June-July. (Plate XXIX, Figure 4, a).

Boggy places, borders of canals, and peat soils. - Arctic: Arct. Eur.; European part: Kar. - Lap. Gen. Distr.: Scand. Described from Sweden. Type in Stockholm.

30. *P. alpigena* (Fr.) Lindm. Sv. Gan.-fl. (1918) 91. - *P. pratensis* var. *alpigena* Fr. Summ. veg. (1846) 76, nom. nud.; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 298. - Exs.: Fries Herb. norm. IX (1842) No 93; Kneuck. Gram. exs. No 462.

Perennial. With long rhizomes; culms 12-20 (40-90 var. *domestica* Lindm.) cm tall, solitary, more or less ascending, glabrous; leaves 1-2 (3) mm broad, more or less folded, rarely flat; ligules ca. 2 mm long. Panicles oblong, contracted, or pyramidal, 3-4 cm long, more rarely to 12 cm (var. *domestica* Lindm.), not dense; spikelets 3-6 mm long,

lanceolate, 2-4-flowered, more or less purplish, not infrequently proliferous (f. *vivipara* Roshev.), glumes lanceolate, obtusish (f. *obtusata* Lindm.) or acute (f. *longiglumis* Lindm.), somewhat unequal; lemmas distinctly nerved, ciliate-pubescent only on the nerves, copiously webbed, July-August. (Plate XXIX, Figure 5).

393 Polar tundra, also borders of water bodies and slopes. -Arctic: all regions; European part: Kar.-Lap., Dv.-Pech.; West. Siberia: Ob. region; East. Siberia: Yenisei, Len.-Kol. Gen. Distr.; Scand. Described from Norway. Type in Christiania [Oslo].

P. alpigena Lindm. x *alpina* L. in Lynge, Vasc. Pl. Nov. Zemlya (1923) 121, tab. XLVII, 15-17. -Distinguished by characters intermediate between *P. alpigena* and *P. alpina*, resembling more closely one or the other of these two species. Spikelets usually proliferous.

Occurring in the region where the two species grow side by side.

P. alpigena Lindm. x *arctica* R. Br. in Lynge Vasc. Pl. Nov. Zemlya (1923) 122, tab. XLVI, 4. -Like the preceding hybrid, it is distinguished by characters intermediate between the parental forms. Spikelets usually proliferous in this hybrid as well.

Occurring in the region where the two species grow side by side; much more frequent than the preceding cross.

31. *P. pinensis* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 773. -*P. sudetica* f. *pinensis* Pohle et *P. pratensis* var. *pinensis* Roshev. in Herb. Ac. Sc. URSS.

Perennial. Loosely tufted, with short rhizomes; culms 30-60 cm tall, glabrous, smooth, leafy up to the inflorescence; leaves narrowly linear, 1.5-3 (4) mm broad, short-acuminate, glabrous underneath, smooth, sparsely puberulent on the upper surface, becoming glabrous; ligules 2-4 mm long, obtuse. Panicle narrowly oblong, (6-) 10-15 cm long and 1-2 cm broad, contracted, with prominently scabrous branches 1-3 (-5) cm long; spikelets 5-6.5 mm long, 2-4-flowered, light green; glumes 3-4 mm long, somewhat unequal, very scabrous on the keel; lemmas distinctly nerved, glabrous, pubescent only on the keel and lateral nerves, webbed below. (Plate XIX, Figure 6).

River banks. -European part: Dv.-Pech. Endemic. Described from Pinezhskii Raion, Yula River, at the sources (1-3 July 1899, R. Pole). Type in Leningrad.

32. *P. sajanensis* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 774.

Perennial. The entire plant purplish, rather densely tufted, with long stolons; culms 20-40 cm tall, ascending, glabrous, smooth, with numerous sterile shoots at the base; leaves narrowly linear, 2-3 mm broad, short-acuminate, flat or folded, the basal long, the cauline short; ligules 2-3 mm long. Panicle pyramidal, 5-10 cm long, to 5 cm broad, with smooth branches; spikelets 4-6 mm long, lanceolate, 3-4-flowered, purplish; glumes ca. 3.5 mm long, subequal; lemmas distinctly nerved, glabrous, with nerves silky-pubescent below, webbed at the base. July-August.

394 Borders of mountain streams. -East. Siberia: Ang.-Sayan. Endemic. Described from Tunkinskii Raion, borders of the river Il'chira (19 August 1902, B. Komarov). Type in Leningrad.

33. *P. pruinosa* Korotki in Fedde, Repert. sp. nov. XIII (1913-15) 291.



Perennial. Plants with pruinose culms and leaves, stoloniferous; culms 10-70 cm tall, slender, glabrous, smooth; leaves linear, 3-5 mm broad, folded; ligules 1/4-3/4 mm long, obtuse. Panicles 5-12 cm long, oblong, branches smooth, in fascicles of 4-5; spikelets 3-5 mm long, 3-6-flowered; glumes unequal, the lower 1-nerved, the upper 3-nerved; lemmas ovate, with prominent nerves somewhat pubescent in lower part, webbed at the base. June-July.

Damp sandy places. - East, Siberia: Ang. - Sayan., Daur. Endemic. Described from Zabaikal'e. Type in Leningrad.

34. *P. sabulosa* Turcz. nomen nudum in Herb. Ac. Sc. URSS. - *Poa pratensis* var. *subulosa* (Turcz) Roshev. (descript.) in Flora Zabaikal'ya (Flora of Zabaikal'e) I (1929) 81. - *M. peschanyi* [sand].

Perennial. Stoloniferous plants, not tufted; culms 10-20 cm tall, solitary, slender, more or less ascending, glabrous; leaves 1-1.5 mm broad, folded; ligules obtuse, ca. 1 mm long. Panicles oblong, loose, 4-6 cm long; spikelets small, 2-3 mm long, ovate, 2-flowered, variegated; glumes broadly lanceolate, about equal; lemmas distinctly nerved, ciliate-pubescent on the lower part of keel and lateral nerves, sparsely and minutely pubescent in upper part, copiously webbed at the base.

Coastal sands. - East, Siberia: Len. - Kol., Daur. Endemic. Described from Zabaikal'e. Type in Leningrad.

35. *P. subglabriflora* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 775.

Perennial. Rhizome creeping; culms 50-80 cm tall, more or less erect, glabrous, smooth; leaves short-acuminate, rather flat, 2-3 mm broad, glabrous; ligules 3-4 mm long, obtuse. Panicles oblong, 7-13 cm long and to 5 cm broad, many-flowered, with branches 5-6 cm long, in fascicles of 5-7; spikelets broadly lanceolate, 5-6 mm long, 4-6-flowered, green; glumes unequal, the lower 1-nerved, the upper 3-nerved; lemmas distinctly nerved, pubescent below on the nerves, webbed at the base. June.

Meadows and forests glades. - East, Siberia: Daur. (Nerchinskii Raion). Endemic. Type in Leningrad.

36. *P. ussuriensis* Roshev. sp. nova in Addenda p. 753. - *P. acroleuca* auct. fl. ross. (non Steud.).

395 Perennial. Sometimes loosely tufted with fibrous roots; culms 35-80 cm tall, ascending, glabrous, smooth, leafy; leaves linear, rather flat, to 5 mm broad, scaberulous on the upper surface; ligules oblong, 1-2 mm long. Panicles oblong, somewhat nodding, 10-20 (-30) cm long, not dense, branches scabrous, to 7 cm long; spikelets ovate-lanceolate, 3-5 mm long,

Explanation to Plate XXIX

1-*Poa pratensis* L., spikelet; 2-*P. strigosa* Hoffm., general view; 3-*Poa setacea* Hoffm., general view; 4-*P. irrigata* Lindm., inflorescence, a) spikelet; 5-*P. alpigena* (Fr.) Lindm., general view; 6-*P. pinigensis* Roshev., spikelet; 7-*P. ussuriensis* Roshev., inflorescence, a) spikelet; 8-*P. ochotensis* Trin., inflorescence, a) spikelet; 9-*P. urjanchaica* Roshev., spikelet; 10-*P. angustiglumis* Roshev., spikelet; 11-*P. Maydelii* Roshev., spikelet; 12-*P. pennisillata* Kom., spikelet; 13-*P. radula* Franch. et Sav., spikelet; 14-*P. palustris* L., a) spikelet, b) ligule; 15-*P. Ganeschii* Roshev., inflorescence, a) spikelet; 16-*P. glauca* Vahl., inflorescence, a) spikelet; 17-*P. podolica* Blocki, inflorescence, a) spikelet.

3-5 (6)-flowered, light green, more rarely slightly tinged; glumes narrowly linear, the lower 1-nerved, shorter and narrower than the upper; lemmas lanceolate-acute, distinctly nerved, glabrous, sparsely pubescent only on the keel and lateral nerves, scantily webbed at the base. June-August. (Plate XXIX, Figure 7, a).

River banks in the taiga. - Far East: Ussur. Gen. Distr.: Northern Korea. Described from Ussuriiskii Krai. Type in Leningrad.

37. *P. ochotensis* Trin. in Mém. Acad. Pétersb. sér. 6, I (1831) 377; Griseb. in Ldb. Fl. Ross. IV, 377.

Perennial. Roots fibrous; culms 30-40 cm tall, slender, glabrous, scabrous; leaves narrow, linear, 1-1.5 mm broad, flat, scabrous; ligules 1-2 mm long. Panicles 7-8 cm long, and 1.5 cm broad, dense, branches prominently scabrous, to 2.5 mm long; spikelets narrowly lanceolate, short-pedicled, 5-6 mm long, 6-7-flowered, green; glumes narrowly lanceolate, the upper slightly larger than the lower; lemmas rather distinctly nerved, silky-ciliate-pubescent only on the keel and lateral nerves, glabrous elsewhere, scantily webbed. (Plate XXIX, Figure 8, a).

Far East: Okhot. Endemic. Described from Okhotsk (1828, Redovskii). Type in Leningrad.

38. *P. urjanchaica* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 775.

Perennial. Dark green plants, loosely tufted, with short stolons; culms 45-80 cm tall, glabrous, smooth or scabrous below the nodes; leaves with keeled sheaths, linear, flat, to 6 mm broad, more or less hooded at the apex, glabrous, scabrous on the upper surface; ligules to 4 mm long. Panicles oblong, 8-15 cm long and to 7 cm broad, branches to 8 cm long in fascicles of 6; spikelets 6-9 mm long and 4 mm broad, 4-8-flowered, green; glumes 3-4 mm long, the upper longer and broader than the lower; lemmas distinctly nerved, glabrous, pubescent below on the nerves, webbed at the base. June-July. (Plate XXIX, Figure 9).

Wet meadows. - East. Siberia: Ang. - Sayan. (Usinskii Krai). Gen. Distr.: Mongolia. Described from Tannu-Tuv. Republic. Type in Leningrad.

39. *P. angustiglumis* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 771. - *P. pratensis* var. *angustiglumis* Roshev. in Herb. Ac. Sc. URSS.

396 Perennial. Rhizomes short-creeping; culms 70-120 cm tall, glabrous, erect, 3-4-noded; leaves narrowly linear, 4-5 mm broad, flat or folded, glabrous on the lower side, puberulent, later glabrescent on the upper side. Panicles more or less pyramidal, 15-20 cm long and to 10 cm broad, branches to 8 cm long, prominently scabrous; spikelets 6-8 mm long, 3-5-flowered, pale green; glumes narrowly lanceolate, 3-4 mm long, more or less unequal, scabrous on the keel; lemmas distinctly nerved, glabrous, pubescent below on the nerves, webbed at the base. June-July. (Plate XXIX, Figure 10).

Deciduous forests. - East. Siberia: Daur.; Far East: Ze. - Būr. and Ussur. Endemic. Described from Ussuriiskii Krai. Type in Leningrad.

40. *P. Maydellii* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 772.

Perennial. Forming small tufts, with fibrous roots and short stolons; culms 70-80 cm tall, erect, 2-noded, stout, smooth, glabrous; leaves

linear, long-acuminate, flat, 3.5-5 mm broad and to 25 cm long, rather scaberulous on the upper surface; ligules 3-5 mm long, oblong. Panicles oblong-pyramidal, open, 17-20 cm long and to 9 cm broad, branches to 12 cm long, arranged in fascicles of 6-8; spikelets lanceolate, 5-7 mm long, 3-6-flowered, greenish; glumes subequal, ca. 3 mm long; lemmas distinctly nerved, glabrous, pubescent only on the keel and lateral nerves, webbed at the base. (Plate XXIX, Figure 11).

East. Siberia: Ang.-Sayan. Endemic. Described from Keskemde, Irkutsk region. (7-24 July 1867, G. Maidel'). Type in Leningrad.

41. *P. Mariae* Reverd. in *Animadv. syst. Herb. Univ. Tomsk.* 1933, No 3-4, p. 2.

Perennial. Rhizomes creeping; culms 20-25 cm tall, solitary or 2-3 in number, with copious remnants of dead leaves at the base; leaves flat, cucullate at the apex, sometimes purple-tinged, the basal $1/8-1/4$ as long as the culm; ligules 2-4 mm long. Panicles fairly compact, ovoid, 2-5 cm long and 1.2-2.2 cm broad, branches slender, smooth, arranged in fascicles of 2-3; spikelets 5.5-7 mm long, ovoid, 3-4-flowered, silky-lustrous, motley-tinged; glumes 4.5-5 mm long; lemmas 4.5-5 mm long, distinctly nerved, densely pubescent only on the keel and lateral nerves, copiously webbed. July.

Borders of mountain streams. - East. Siberia: Ang.-Sayan. Endemic. Described from the Sul-Daban Pass in western Sayany (16 July 1928, V. Reverdatto). Type in Tomsk.

42. *P. penicillata* Kom. in *Not. Syst. Herb. Horti Bot. Petrop.* V (1924) 148. - *Poa occidentalis* Hult. *Fl. Kamtch.* 1 (1927) 129 (non Vasey). - *Poa leptocoma* F. elatior Scribn. et Merr. in *Contr. U. S. Nat. Herb.* XIII, 3 (1910) 71 (?).

397 Perennial. Rather loosely tufted, with rhizome creeping; culms 50-80 (-100) cm tall, slender, glabrous, smooth; leaves long-acuminate, 5-15 cm long and 2.5 mm broad, rather flat, smooth underneath, scabrous on the upper surface; ligules 1-2 (-3) mm long. Panicles 10-15 cm long, open, loose, branches slender, scabrous, to 10 cm long, each bearing 2-5 spikelets; spikelets large, 6-8 mm long, lance-elliptical, 3-5-flowered, green or more or less purplish; glumes lanceolate, unequal; lemmas elongate-lanceolate, rather distinctly nerved, naked, densely sericeous on the keel and lateral nerves, webbed at the base. June-August. (Plate XXIX, Figure 12).

Dry meadows. - Far East: Kamch. Gen. Distr.: N. Am. (Alaska) ? Described from Kamchatka, Abachi River basin. Type in Leningrad.

43. *P. radula* Fr. et Sav. *Enum. Pl. Japon.* II (1879) 602.

Perennial. Rhizome short-creeping; culms 40-90 cm tall, erect, rather scabrous, flattened, 2-edged; leaf sheaths glabrous, rather scabrous; leaves light green, to 9 mm broad, flat, smooth on the lower surface, rather scabrous on the upper; ligules ca. 2 mm long. Panicles large, open, to 30 cm long, not dense, branches to 10 cm long, scaberulous; spikelets 5-7 mm long, green, 3-6-flowered; glumes narrowly lanceolate, somewhat unequal, scabrous; lemmas narrowly lanceolate, glabrous, slightly sericeous on the keel, scantily webbed at the base. June-July. (Plate XXIX, Figure 13).

Forest borders and grassy thickets. - Far East: Kamch., Ze. - Bur., Sakhal. Gen. Distr.: Jap. - Chin. Described from Japan. Type in Paris.

Series 7. *Palustres* Roshev. - Lemmas with rather indistinct, more or less pubescent nerves, glabrous, webbed at the base. Plants of wet meadows, mountain slopes and, more rarely, forests. All over the Union.

44. *P. palustris* L. Syst. ed. 10 (1759) 874; Kryl. Fl. Zap. Sib. II, 293. - *P. serotina* Ehrh. Beitr. VI (1791) 86; Griseb. in Ldb. Fl. Ross. IV, 375; Shmal'g. Fl. II, 636. - *P. fertilis* Host, Gram. Austr. III (1805) 10, tab. 15. - *P. kamtschatica* Fisch. in herb. Leningr. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 87, fig. 1645 (aub *Poa angustifolia* Whlbg.). - Exs.: Schulz, Herb. norm. No 388.

Perennial. Tufted, stoloniferous; culms 20-80 cm tall, ascending, more rarely semidecumbent (var. *subrepens* Roshev.), cylindrical, smooth; leaves narrowly linear, acuminate, flat, scabrous; ligules to 3 mm long. Panicles to 20 cm long, open, many-flowered (var. *fertilis* (Host) Asch. et Gr.), more rarely loose (var. *effusa* Asch. et Gr.), with prominently scabrous branches (var. *breviramea* Roshev.); spikelets to 5 mm long, 2-3-flowered (the common form and var. *fertilis* (Host) Asch. et Gr.), more rarely 4-5-flowered (var. *glabra* Asch.) or 398 1-2-flowered (f. *depauperata* Asch. et Gr.), greenish or more or less variegated; glumes subequal; lemmas obscurely nerved, puberulent on the keel and lateral nerves, webbed at the base. May-July. (Plate XXIX, Figure 14, a, b).

Wet meadows, forest borders, and river valleys. - European part: all regions (Crimea ?); Caucasus: Ciscauc., Dag., West. and East. Transcauc.; West. Siberia: all regions; East. Siberia: all regions; Far East: all regions; Centr. Asia: all regions (except Kara-Kum and Amu. Dar.). Gen. Distr.: Scand., Centr. and Atlant. Eur., Balk. - As. Min., Jap. - Chin., N. Am. Described from Switzerland. Type in London.

NOTE. Developing late, beginning to flower only at the beginning of summer. A grass producing a large amount of foliage, recovering well after cutting. Prefers fresh, moist soils. A good fodder plant, giving an abundant second harvest; eaten readily by livestock both green and as hay. In North America it is considered a valuable fodder plant of wet meadows. On suitable soils it yields from 2.2-6.75 tons per hectare. It attains full development in the third year.

45. *P. Ganeschini* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

Perennial. Tufts small, loose; rhizome short-creeping; culms 15-35 cm tall, more or less ascending, glabrous, smooth, leafless above; leaves linear-acuminate, to 2 mm broad, flat, smooth underneath, scabrous on the upper surface, glabrous; ligules ca. 2 mm long, obtuse. Panicles oblong, rather open, 4-7 cm long, branches prominently scabrous, to 2 cm long, each bearing 1-2 spikelets; spikelets elliptical, 5-8 mm long, 3-5-flowered, variegated; glumes lanceolate, subequal; lemmas obscurely nerved, fairly long-pubescent on the keel and lateral nerves, glabrous elsewhere, scantily webbed at the base. August. (Plate XXIX, Figure 15).

Between stones on sod-covered slopes. - European part: Kar. - Lap. Endemic. Described from the central part of Kol'skii Peninsula, Khibinskie Mountains, slopes and valleys of Kukisvum (1930, S. S. Ganeschin). Type in Leningrad.

46. *P. glauca* Vahl, Fl. Dan. fasc. 17 (1790) 3. - *Poa caesia* Smith, Fl. Brit. (1800) 103; Griseb. in Ldb. Fl. Ross. IV, 374. - Ic.: Fl. Dan. tab. 964.

Perennial. Glaucous, tufted, stoloniferous plants; culms 20-40 cm tall, erect, glabrous, smooth or scabrous at the top; leaves narrowly linear, long-acuminate, 1-2 mm broad, scabrous on the margin; ligule on lower leaves very short, on upper leaves to 1 mm long. Panicles 3-6 (-8) cm long, contracted at first, finally somewhat open, branches scabrous, to 2.5 cm long, each bearing 2, rarely 4 spikelets; spikelets oblong-ovate, 4-5 mm long, 2-3 (-5)-flowered, often more or less purplish; glumes narrowly lanceolate, subequal; lemmas rather indistinctly nerved, narrowly lanceolate, glabrous, sericeous only on the keel and lateral nerves, scantily webbed. July-August. (Plate XXIX, Figure 16, a).

Dry slopes and rocks. - Arctic: Arct. Eur., Arct. Sib.; European part: Kar.-Lap., Dv.-Pech.; East. Siberia: Yenisei (north. part), Lena.-Kol. (north). Gen. Distr.: Arctic region, Scand., N. Am. Described from Scandinavia (Finnmark). Type in Copenhagen.

47. *P. podolica* Blocki in Deutsch. Bot. Monatsch. III (1885) 131 nomen.; Asch. et Gr. Syn. II (1900) 412. - Exs.: Asch. et Gr. Syn. II (1900) 412. - Exs.: Schulz, Herb. normale No 2292.

Perennial. Tufted; rhizome short-creeping; culms 30-70 cm tall, very scabrous, firm; leaves narrowly linear, to 2 mm broad, flat or somewhat folded, scabrous. Panicle 5-10 cm long, loose, with hard, with obliquely rising or subhorizontal, prominently scabrous branches; spikelets 5-6 mm long, cuneate-lanceolate, 3-5-flowered, dingy green, ultimately turning yellow; glumes lanceolate, subequal, scabrous on the keel; lemmas obscurely nerved, narrowly lanceolate, pubescent on the keel and lateral nerves, webbed at the base. July. (Plate XXIX, Figure 17, a).

Rocks. - European part: Mid. Dnep. Gen. Distr.: North. Eur. Described from southeastern Galicia.

48. *P. versicolor* Bess. Enum. Vohl. (1821) 41. - *P. sterilis* versicolor Griseb. in Ldb. Fl. Ross. IV (1853) 375 ex parte.

Perennial. Culms 50-70 cm tall, erect, terete, glabrous, very prominently scabrous; leaves narrowly linear, 1.5-3 mm broad, flat or involute, very scabrous; ligules to 3 mm long, more or less lacerate. Panicles large, to 18 cm long and 10 cm broad, oblong or pyramidal, with prominently scabrous branches to 8 cm long; spikelets lanceolate-acuminate, 6-8 mm long, 3-5-flowered, motley-tinged; glumes linear-lanceolate, the upper larger than the lower; lemmas narrowly lanceolate, to 7 mm long, acute, obscurely nerved, glabrous, sericeous only on the nerves, webbed at the base. (Plate XXX, Figure 1).

Stony slopes. - European part: (Podoliya, 1822). Gen. Distr.: Centr. Eur. Described from Podoliya. Type in Leningrad.

49. *P. altaica* Trin. in Ldb. Fl. alt. I (1829) 97; Griseb. in Ldb. Fl. Ross. IV, 373; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 290. - Ic.: Ldb. Ic. pl. Fl. Ross. III (1831) tab. 225.

Perennial. Forming small tufts; rhizome creeping; culms 10-30 cm tall, rather erect, smooth; leaves green, linear, 1-3 mm broad, flat or partly folded, faintly scaberulous on the margin, cauline leaves very long, exceeding the basal, smooth-sheathed; ligules 1.5-3 cm broad, branches rather scabrous, arranged in verticils of 2-4; spikelets 4-5 mm long.

400 2-3-flowered, motley-green-purple; glumes lanceolate, acute, the upper somewhat longer than the lower; lemmas lanceolate, obscurely nerved, sericeous on the lower part of the keel and marginal nerves, glabrous elsewhere, scantily webbed at the base. July-August. (Plate XXX, Figure 2, a).

Alpine meadows and mountain slopes. - West. Siberia: Alt. Endemic. Described from Chuiskie Belki. Type in Leningrad.

ECONOMIC IMPORTANCE. Readily grazed in pasture by all kinds of livestock.

50. *P. tristis* Trin. ex Bge. in Mem. pres. Acad. Sc. Petersb., II, 6 (1835) 528; Kryl. Fl. Zap. Sib. II, 288. - *P. laxa* β *tristis* Griseb. in Ldb. Fl. Ross. IV (1853) 372.

Perennial. Forming small tufts; rhizome shortened, with fibrous roots; culms 8-15 cm tall, rather erect, smooth; leaves narrow, 0.5-1.5 mm broad, more or less folded, stiff, scabrous on the margin, smooth-sheathed; ligules 1.5-2 mm long. Panicles few-flowered, very narrow, subracemose, 1.5-4 cm long and 4-10 mm broad, branches prominently scabrous, arranged singly or in twos; spikelets 4-5 mm long, 1-3-flowered, more or less purplish; glumes narrowly lanceolate, acute, slightly shorter than the spikelet, somewhat unequal; lemmas rather obscurely nerved, pilose in lower part on the keel and lateral nerves, scantily webbed at the base. (Plate XXX, Figure 3, a).

Alpine zone. - West. Siberia: Alt. Endemic. Described from Altai. Type in Leningrad.

51. *P. masenderana* Freyn et Sint. in Bull. Herb. Boiss., ser. 2, II (1902) 915. - *P. versicolor* Trin. ex Griseb. in Ldb. Fl. Ross. IV, 375 (non Bess.).

Perennial. Light green, loosely tufted plants; culms 25-45 cm tall, more or less ascending, slender, weak, glabrous, leafy; leaves linear-lanceolate, flat, to 4 mm broad, glabrous, smooth; ligules subobtus, ca. 1 mm long. Panicles more or less nodding, oblong-ovoid, to 15 cm long, few-flowered, with branches up to 5 cm long. Spikelets 5-7 mm long, broadly lanceolate, 3-4-flowered, light green; glumes unequal, narrowly lanceolate; lemmas obscurely nerved, glabrous, puberulent on the keel and lateral nerves, scantily webbed at the base. April-May. (Plate XXX, Figure 4, a).

Forests. - Caucasus: recorded for Tal. Gen. Distr.: northern Persia. Described from Bender-Ghes, Astrabad district. Type in Vienna.

52. *P. nemoralis* L. Sp. pl. (1753) 69; Griseb. in Ldb. Fl. Ross. IV, 375; Shmal'g. Fl. II, 636; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 291. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 86, fig. 1638-1643. - Exs.: Kneucker, Gram. exs. No 268.

401 Perennial. Light green plants, with short stolons, loosely tufted; culms 30-100 cm tall, ascending, often rooting at the nodes, smooth; leaves narrowly linear, to 2 mm broad, rather scabrous, strongly spreading with smooth, more rarely very scabrous (var. *rigidula* Martens et Koch), sheaths; ligules lacking or very short. Panicles to 10 cm long, rather open, more rarely contracted (var. *coarctata* Gaud.), with scaberulous branches; spikelets 2-5-flowered, more rarely 1-flowered (var. *uniflora* Mertens et Koch), 3-4 mm long (in var. *formula* Gaud. - 5 mm), rachilla pubescent; pale green, golden-tipped, glumes subequal; lemmas

obscurely nerved, puberulent on the keel and lateral nerves, glabrous elsewhere, scantily webbed at the base. Spikelets occasionally proliferous (var. *vivipara* Litw.). May-July. (Plate XXX, Figure 5, a, b).

Forests and coppices, more rarely meadows. - European part: all regions; Caucasus: all regions; West. Siberia: all regions; East. Siberia: all regions (Len.-Kol. ?); Far East: Kamch., Ze.-Bur., Uda, Ussur., Sakh.; Centr. Asia: Dzung.-Tarb., Upp. Trukm., Syr-Dar., Pam.-Al. Tyan¹-Shan. Gen. Distr.: all Europe (mountains in the south), Asia Minor, Iran, Ind.-Him., Jap.-Chin., N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Eaten readily by livestock, but of no great fodder value on account of its rather exacting requirements as regards soil; develops satisfactorily in shade.

Series 8. *Stepposae* Roshev. - Plants with sparingly leaved culms. Lemmas with rather indistinct, more or less pubescent nerves, glabrous, or pubescent, always webbed at the base. Plants of steppes and dry mountain slopes. All over the Union.

53. *P. stepposa* (Kryl.) Roshev. sp. nov. in Addenda p. 754. - *P. attenuata* var. *stepposa* Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II (1928) 285. - *P. sterilis* auct. Fl. sib. partim.

Perennial. Densely tufted, with fibrous roots; culms 15-50 cm tall, glabrous, rather strongly pubescent, often almost completely leafless in upper part; leaves narrowly linear, 0.5-1.25 mm broad, glabrous, flat or involute, blades and sheaths more or less scabrous; ligules elongate, 2-3 mm long. Panicle contracted, narrow, to 10 cm long, branches prominently scabrous, bearing small a number of spikelets; spikelets lanceolate, 3-5 mm long, 3-5-flowered, yellowish-green, golden-tipped, rarely somewhat purple; glumes subequal, lanceolate; lemmas obscurely nerved, puberulent on the keel and lateral nerves, glabrous elsewhere, scantily webbed at the base. June-July. (Plate XXX, Figure 6, a).

Dry pebbly and stony slopes and mountain steppes. - European part: Volg.-Kam. (Ural), Zavolzh.; Caucasus: Ciscauc.; West. Siberia: all regions; East. Siberia: Yenisei. Endemic. Described from the mountain steppes of Altai. Type in Tomsk.

402 54. *P. relaxa* Ovcz. in Izv. Tadzhikist. Bazy Ak. Nauk (Rep. Tadzhikist. Base of the Acad. Sc. USSR) I, 1 (1933) 20. - *P. palustris*, *P. sterilis* auct. fl. Asiae Mediae ex parte.

Perennial. Rather densely tufted; culms 30-50 cm tall, numerous, erect, rather firm, leafy, more or less scabrous, sometimes nearly smooth, surrounded at the base with reddish sheaths of old leaves; leaves few, linear, to 2 mm broad, flat, scabrous, with smooth, more rarely scabrous sheaths; ligules 1-1.5 mm long, oblong, subobtusely, lacerate. Panicle 8-15 cm long, oblong, rather contracted, many-flowered; panicle branches 2-3 cm long, set singly or up to 4 per fascicle, unequal, often divided; spikelets silky-green, to 6 mm long, 3-4 (5)-flowered, oblong-lanceolate or lance-elliptical; glumes somewhat unequal, oblong-lanceolate, acute, green or somewhat purplish, scarious-margined, scabrous on the keel; lemmas rather obscurely nerved, oblong-lanceolate, subobtusely or serrulate, with a white or gloden-yellow hyaline margin, rather loosely webbed at the base, keel and lateral nerves covered with appressed, silky hairs; anthers to 2 mm long, narrow, yellow. June-August.

Rocks and stony places, occasionally steppe plots, ascending into the alpine zone. - Centr. Asia: Syr-Dar.; Pam. - Al. Endemic. Described from Zeravshanskii Range. Type in Leningrad.

55. *P. glauciculmis* Ovcz. in Izv. Tadzhihist. Bazy Ak. Nauk (Rep. Tadzhihist. Base of Acad. Sci. USSR) 1, 1 (1933) 19.

Perennial. Glaucous, densely tufted plants; culms 25-35 cm tall, stoutish, firm, glaucous, more or less compressed in upper part; leaves flat, to 2.5 mm broad, or more or less involute, long-acuminate, scaberulous or glabrous; ligules 0.5-1.5 mm long, obtuse or pointed, cleft; leaf sheaths longer than the internodes. Panicles oblong or more or less oblong-pyramidal, dark purple; panicle branches prominently scabrous, unequal, 1-1.7 cm long, in fascicles of 2-3; spikelets oblong-elliptical, to 6 mm long, 3-4-flowered, dark purple, rather crowded; glumes lanceolate, acute, glabrous; lemmas rather obscurely nerved, with loose hairs at the base, slightly emarginate at the tip, rather long-pilose on the keel and lateral nerves, with a yellowish-tawny hyaline margin; palea emarginate, ciliolate on the margin; caryopsis free, oblong, 3-angled. August.

Stony slopes. - Centr. Asia: Pam. - Al. Endemic. Described from Zaalaiskii Range. Type in Leningrad.

56. *Poa araratica* Trautv. in A. H. P. II (1873) 486. - *P. attenuata* Boiss. Fl. or. V (1884) 608 non Trin. - *P. versicolor* var. *araratica* Grossh. in Fl. Kavk. (Fl. Cauc.) I (1928) 109.

- 403 Perennial. Rather densely tufted; rhizomes short-creeping; culms 20-25 cm tall, more or less erect, scabrous, numerous, surrounded at the base with basal leaves and old sheaths; leaves narrowly linear, flat, to 1.5 mm broad, scabrous; ligules ca. 2 mm long, subobtuse. Panicle 3-5 cm long and 5-8 mm broad, contracted; branches short, scabrous, set singly or up to 3 per fascicle; spikelets 2-4-flowered, lanceolate, ca. 5 mm long, pale-colored; glumes lanceolate, somewhat unequal; lemmas narrowly lanceolate, rather obscurely nerved, puberulent on the keel and lateral nerves, glabrous elsewhere, web obsolete. July-August. (Plate XXX, Figure 7).

Meadow slopes. - Caucasus: South. Transcauc. Gen. Distr.: Arm. - Kurd. Described from Great Ararat. Type in Leningrad.

57. *P. attenuata* Trin. in Bunge, Suppl. Fl. Alt. (1830) 9; Trin. in Mém. Acad. Sc. Pétersb., sér. 6, IV Suppl. (1833) 64; Griseb. in Ldb. Fl. Ross. IV, 371; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 285 ex parte.

Perennial. Tufted; with fibrous roots; culms 20-30 cm tall, slender, more or less ascending, glabrous, smooth, with 4-5 nodes, leafy up to the middle; leaves narrowly linear, setaceous-involute; ligules to 2.5 mm long. Panicles contracted, oblong, 4-7 cm long and ca. 1.5 cm broad, slightly tinged, branches glabrous; 0.4-2 cm long, in 1's-3's; spikelets lanceolate, 4-5 mm long, 3-5-flowered, rachilla glabrous; glumes narrowly lanceolate, subequal, 2.5-3 mm long; lemmas narrowly lance-acuminate, 3-3.5 mm long, obscurely nerved, glabrous, puberulent only on the lower part of the keel and lateral nerves, webbed at the base. (Plate XXX, Figure 8).

Steppe and alpine meadows. - West. Siberia: Alt. Endemic. Described from the upper reaches of Dzhelo River. Type in Leningrad.

58. *P. botryoides* Trin. in herb. Fl. Zabaikal'ya (Fl. of Zabaikal'-e) I (1929) 83 (Russ. diagn.). - *Poa serotina* *botryoides* Trin. ex

Griseb. in Ldb. Fl. Ross. IV (1853) 375. - *P. palustris* var. *botryoides* Hack. in herb. Leningrad. - Exs.: HFR No 999 (sub *Poa attenuata*). - *M. kistevidnyi* [cluster-like].

Perennial. Densely tufted, with fibrous roots; culms 30-60 cm tall, glabrous, rather strongly scabrous, more rarely scaberulous (var. *subleavis* Roshev.), almost leafless above; leaves narrowly linear, 0.5-1.0 mm broad, flat or more or less involute, blades and sheaths scabrous; ligules ca. 1.2 mm long. Panicles narrowly oblong, contracted, interrupted, 2-6 cm long and 0.5-0.7 cm broad, with short, prominently scabrous branches; spikelets 2-5-flowered, narrowly lanceolate, ca. 4-5 mm long, rachilla glabrous; glumes 3-nerved, unequal, ca. 2-2.5 mm long; lemmas obscurely nerved, glabrous, puberulent only on the keel and lateral nerves, scantily webbed at the base. June-August. (Plate XXX, Figure 9).

404 Dry steppe and stony places. - East. Siberia: all regions; Far East: Ze. - Bur., Ussur. Described from Irkutskii Raion. Type in Leningrad.

ECONOMIC IMPORTANCE. A good forage plant. It should be tried out in cultivation on chernozem and chestnut soils.

59. *P. dahurica* Trin. in Mém. Acad. Pétersb., sér. 6, IV (1836) 64. - *P. attenuata* y *dahurica* Griseb. in Ldb. Fl. Ross. IV (1853) 371; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 285.

Perennial. Roots fibrous; tufts compact; culms numerous, glabrous, smooth, 8-18 cm tall; leaves narrowly linear, 0.5-1.2 mm broad, folded, or the basal flat; glabrous, veins scabrous on the upper side; ligules 1.5-2 mm long, subobtuse. Panicle 2-3.5 cm long and 0.5-1.0 cm broad, rather compact, branches scabrous, 0.2-1.0 cm long; spikelets ovate, 3-4 mm long, 3-4-flowered, more or less purplish; glumes subequal, acute; lemmas obscurely nerved, glabrous, puberulent only on the keel and lateral nerves, scantily webbed. June-July.

Alpine meadows and subglacial tundras. - West. Siberia: Alt., East. Siberia: Ang. - Sayan., Daur. Described from Zabaikal'e (Dauriya). Type in Leningrad.

60. *P. transbaicalica* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS (1929) 382.

Perennial. Tufts small; not stoloniferous; roots fibrous; culms 35-70 cm tall, glabrous; very scabrous below the inflorescence; leaves linear-acuminate, 1-2 mm broad, flat or more or less involute, scabrous; ligules 2-2.5 mm long, obtuse. Panicles oblong, to 12 cm long, rather contracted; spikelets 6-7 mm long, 5-8-flowered, green; glumes about equal, acute; lemmas rather obscurely nerved, glabrous, puberulent only on the keel and lateral nerves, web obsolete. June. (Plate XXX, Figure 10).

Meadows. - East. Siberia: Daur. Endemic. Described from Zabaikal'e. Type in Leningrad.

61. *P. argunensis* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

407 Perennial. Tufted, with short-creeping rhizome and fibrous roots; culms 25-40 (-60) cm tall, rigid, scabrous, leafless in upper part; leaves narrowly linear, 0.5-1.5 mm broad, flat or folded, 1.5-3 cm long, scabrous on the upper surface; ligules ca. 3 mm long. Panicles short, 3-5 cm long, contracted, open only in anthesis, oblong, branches scabrous, to 2 cm long;



spikelets lanceolate, ca. 4 mm long, 2-3-flowered, green or more or less purplish; glumes somewhat unequal, broadly lanceolate, somewhat scabrous, much shorter than the spikelets; lemmas narrowly lanceolate, rather obscurely nerved, pubescent below, with longer, silky hairs on the keel and lateral nerves, webbed at base. July-August. (Plate XXX, Figure 11).

Meadows, steppes, and fields. -East. Siberia: Daur. Endemic. Described from the steppes along the rivers Urul'yungui and Argun', from the collections of M. Ivanova and K. Konovalova, 1930. Type in Leningrad.

62. *P. sphondylodes* Trin. ex Bge. in Mém. Sav. étr., Petersb. II (1835) 145.

Perennial. Dense tufted, with fibrous roots; culms 55-60 cm tall, erect, slender, glabrous, scaberulous; leaves narrowly linear, to 2 mm broad, long-acuminate, flat, glabrous, the upper surface scabrous; ligules pointed, on upper leaves to 4 mm long. Panicles narrow, 3-6 cm long and 1-1.5 cm broad, somewhat lobed, branches scabrous, 0.3-0.7 cm long; spikelets narrowly linear, 5-6 mm long, 4-6-flowered, light green; glumes narrowly lanceolate, unequal; lemmas rather obscurely nerved, narrowly lanceolate, with long, silky cilia on the keel and lateral nerves, glabrous elsewhere, scantily webbed. June. (Plate XXX, Figure 12, a).

Oak and pine woods, on gravelly soil. -Far East: Ze. -Bur., Uda. Gen. Distr.: Jap. -Chin. Described from northern China. Type in Leningrad.

63. *P. Reverdattoi* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

Perennial. Densely tufted, with fibrous roots; culms erect, 25-40 cm tall, rigid, very scabrous, leafless above; leaves narrowly linear, acuminate, 0.5-1.25 mm broad, flat or partly folded, very scabrous; ligules oblong, 1-2 mm long. Panicles narrow, contracted, sublinear, 4-8 cm long and to 5 mm broad, with short, prominently scabrous, appressed branches; spikelets lanceolate-acute, 5-6 mm long, 2-4-flowered, green, turning yellowish; glumes narrowly lanceolate, long, subequal; lemmas rather obscurely nerved, puberulent in lower part, with long, silky hairs on the keel and lateral nerves, not webbed at the base. July. (Plate XXX, Figure 13, a).

Explanation to Plate XXX

1-*Poa versicolor* Bess., spikelet; 2-*P. altaica* Trin., inflorescence, a) spikelet; 3-*P. tristis* Trin., general view, a) spikelet; 4-*P. masenderana* Frey. et Sint., inflorescence, a) spikelet; 5-*P. nemoralis* L., a) spikelet, b) ligule; 6-*P. stepposa* (Kryl) Roshev., inflorescence, a) spikelet; 7-*P. araratica* Trautv., spikelet; 8-*P. attenuata* Trin., spikelet; 9-*P. botryoides* Trin., spikelet; 10-*P. transbaicalica* Roshev., inflorescence, a) spikelet; 11-*P. argensis* Roshev., spikelet; 12-*P. sphondylodes* Trin., inflorescence, a) spikelet; 13-*P. Reverdattoi* Roshev., inflorescence, a) spikelet; 14-*P. compressa* L., inflorescence, a) spikelet, b) culm in section; 15-*P. sterilis* M. B., spikelet; 16-*P. rhomboidea* Roshev., spikelet; 17-*P. lanatiflora* Roshev., general view, a) spikelet; 18-*P. arctica* R. Br., spikelet; 19-*P. petsochorica* Roshev., spikelet; 20-*P. Tolmatchewi* Roshev., spikelet, a) general view.

408 Rocky slopes. -East. Siberia: Ang. -Sayan. Endemic. Described from Abanskaya Steppe. Type in Leningrad.

64. *P. compressa* L. Sp. pl. (1753) 69; Griseb. in Ldb. Fl. Ross. IV, 371; Shmal'g. Fl. II, 636; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 224. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 85, fig. 1637, 1636. -Exs.: Kneucker, Gram. exs., No 271.

Perennial. Grayish-green plants, with a long, creeping rhizome; culms 15-50 cm tall, ascending, flattened, smooth, more rarely scabrous; leaves narrowly linear, occasionally more or less involute, somewhat scabrous, with flattened, keeled sheaths; ligules short, obtuse. Panicles oblong, to 10 cm long, rather dense, with short, scabrous branches, more rarely larger, with elongated branches (var. *Langeana* Rchb.); spikelets to 4 mm long, 3-8-flowered, greenish or more or less brownish-purple; glumes about equal; lemmas obtuse, rather obscurely nerved, glabrous, slightly pubescent only on the keel and lateral nerves; web scant or lacking. May-July. (Plate XXX, Figure 14, a, b).

Clay, stony and sandy slopes, and roadsides. -European part: all regions (except Low. Volg.); Caucasus: Ciscauc., Dag., West. and East. Transcauc.; East. Siberia: Daur. (introduced?). Gen. Distr.: Scand., Centr. and Atl. Eur., Mediterranean, Balk. -As. Min., N. Am. (introduced). Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Unpretentious as regards environmental conditions; yields a small amount of fodder of low quality; suitable only for grazing in stony, dry, and sandy places.

Series 9. Steriles Roshev. -Lemmas with rather obscure, more or less pubescent nerves, glabrous, not webbed at the base. Plants of stony places and river banks.

65. *P. sterilis* M. B. Fl. taur. -cauc. I (1805) 62; Griseb. in Ldb. Fl. Ross. IV, 374; Shmal'g. Fl. II, 637.

Perennial. Occasionally tufted; roots fibrous; culms 20-35 (-55) cm tall, very scabrous; leaves narrowly linear, ca. 1 mm broad, flat or more or less involute, the upper ones spreading or reflexed, smooth-sheathed; ligules 1-2 mm long. Panicles 6-14 cm long, rather contracted, attenuate toward the top, main axis very scabrous, branches very scabrous, to 5 cm long, erect; spikelets 5-6 mm long, broadened toward the summit, 2-3-flowered, green rachilla pubescent; glumes subequal, narrowly lanceolate, 3.5-4 (-4.5) mm long; lemmas narrowly lanceolate, 3.5-4.5 mm long, obscurely nerved, pubescent on the keel and lateral nerves, not webbed at the base. May-July. (Plate XXX, Figure 15).

Stony places and calcareous soils. -European part: Ciscauc., Crimea; Caucasus: Ciscauc., Dag., West. Transcauc. Endemic. Described from Crimea. Type in Leningrad.

66. *P. rhomboidea* Roshev. sp. nova in Addenda p. 764.

Perennial. Tufted; rhizome short-creeping; culms 40-45 cm tall, glabrous, smooth, leafy; leaves narrowly linear, ca. 1.5 mm broad, long-acuminate, flat, glabrous, smooth, scabrous on the upper surface; ligules ca. 0.5 mm long, obtuse. Panicles few-flowered, 5-8 mm long, with scabrous branches, 1.5-2.5 cm long, arranged in twos, each bearing 1-2 spikelets; spikelets ca. 8 mm long and 5-6 mm broad, more or less rhomboid, 7-8-flowered, whitish-mottled-colored; glumes somewhat unequal, narrowly lanceolate; lemmas lanceolate, obscurely nerved, pubescent on the keel and lateral nerves, glabrous elsewhere, not webbed. August. (Plate XXX, Figure 16).

River banks, -Caucasus: west, Transcauc. Endemic. Described from Chernomorskii Okrug, by the river Psukh (tributary of Mzymta) (3 August 1895, V. Lipskii). Type in Leningrad.

Series 10. *Lanatiflorae* Roshev. -Lemmas with rather indistinct, more or less pubescent nerves, glabrous, profusely webbed at the base. Plants of the arctic zone.

67. *P. lanatiflora* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 303.

Perennial. Rhizome creeping; culms 20-30 cm tall, ascending, glabrous, smooth, leafless in upper part; leaves narrowly linear, flat or folded, 2-3 mm broad, glabrous, smooth, slightly scabrous on the upper surface; ligules 2 mm long, lacerate. Panicles oblong, 4-8 cm long and 2-4 cm broad, rather contracted, many-flowered; spikelets 5-7 mm long and 3-4 mm broad, 3-4-flowered; glumes unequal, the lower 1-nerved, the upper 3-nerved; lemmas rather obscurely nerved, glabrous, woolly-pubescent only on lower part of the keel and lateral nerves, webbed at the base. July. (Plate XXX, Figure 17, a).

Dry places with sandy soil. -East. Siberia: Len.-Kol., Verkhoyanskii Raion. Endemic. Type in Leningrad.

68. *P. taimyrensis* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 299.

Perennial. Roots fibrous; culms 7-14 cm tall, erect, glabrous, smooth; leaves narrowly linear, folded, to 3 cm long and 1.5 mm broad, glabrous; ligules 1-1.5 mm long, oblong. Panicles oblong or pyramidal, 3-6 cm long, few-flowered, with branches 1-4 cm long; spikelets 4.5-5 mm long, lanceolate, 3-4-flowered, purple; spikelets lanceolate, the upper slightly larger than the lower; lemmas rather obscurely nerved, glabrous, puberulent only on the nerves in lower part, webbed at the base. August.

Tundra. -Arctic: Arct. Siberia. Endemic. Described from eastern Taimur, lower reaches of the river Yamu-Nery, 74° 50' N lat. and 106° E long. (21 August 1928, No 825, A. I. Tol'machev). Type in Leningrad.

410 69. *P. soczawai* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 298.

Perennial. Loosely tufted; roots fibrous; culms 15-17 cm tall, erect, glabrous, rather smooth; leaves narrowly linear, folded or partly flat, 1.5-2.0 mm broad, glabrous; ligules ca. 0.5 mm long, obtuse. Panicles oblong, 2.5 cm long and 0.7-1.5 cm broad, rather contracted, few-flowered, with branches to 1.5 cm long; spikelets ca. 4 mm long, 2-3-flowered, motley-tinged; glumes lanceolate, 2.5-3.5 mm long, the upper larger than the lower; lemmas obscurely nerved, puberulent only on the nerves in lower part, webbed at the base. August.

Coastal rocks. -Arctic: Anadyrskii Krai, Belaya River basin, left trib. of Anadyr' River, at the foot of Bitcho Range (1 August 1919, V. B. Sochava). Type in Leningrad.

Series 11. *Arcticae* Roshev. -Low plants. Lemmas pubescent on the nerves and internerves; webbed at the base. Arctic and alpine plants.

70. *P. arctica* R. Br. in Parry Voy. Suppl. (1823) 288; Griseb. in Ldb. Fl. Ross. IV, 373; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 289. -*P. flexuosa* Whlbg. Fl. suec. (1824) No 108. -*Id.*: Lyngb. Vasc. Pl. Nov. Zemiya (1923) 118, tab. XLVI 2, XLVII, 3-8, 14. -*Exs.*: Fries, Herb. norm. III (sub *P. flexuosa*).

Perennial. Rhizomes long, yellowish; culms 10-30 cm tall, slender, more or less ascending, glabrous; leaves narrowly linear, 1-2 (-3) mm

broad, flat or more or less folded; ligules ca. 2 mm long. Panicles broadly pyramidal, not dense, 3-6 cm long; spikelets 4-7 mm long, 2-4-flowered, more or less purple; glumes lanceolate, somewhat unequal; lemmas rather obscurely nerved, densely pubescent in lower part, scantily webbed at the base. June-September. (Plate XXX, Figure 18).

Polar tundra; more to the south, on bare hills. -Arctic: all regions; European part: Kar. -Lap. (White Sea islands); East. Siberia: Len. -Kol., Daur.; Far East: Kamch., Okhot. Gen. Distr.: Arctic, Bering. Described from Arctic America. Type in London, cotype in Leningrad.

ECONOMIC IMPORTANCE. Readily eaten by deer in spring and early summer.

71. *P. petschorica* Roshev. Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 773.

Perennial. Plants with short rhizomes, forming loose tufts; culms 20-25 cm tall, erect, glabrous, smooth; leaves narrowly linear, 1-2 mm broad, folded, glabrous, smooth; ligules ca. 1-2 mm long, oblong. Panicles many-flowered, oblong, 6-8.5 cm long and 1-1.5 cm broad, with smooth branches 1-2 cm long; spikelets 4-5 mm long, lanceolate, 2 (-3)-flowered, whitish-green, more rarely slightly purplish; glumes lanceolate, 2.5-3.5 mm long, unequal; lemmas distinctly nerved, puberulent in lower part, webbed. (Plate XXX, Figure 19).

411 Tundra. -Arctic: Arct. Europe, Bol'shezemel'skaya Tundra, Pechorskii Bay, Bolvannoe (25 August 1924, A. Popov). Endemic. Type in Leningrad.

72. *P. Tolmatchewii* Roshev. Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 299.

Perennial. Sometimes tufted; rhizome short-creeping; culms 30-45 cm tall, glabrous, smooth, leafless in upper part; leaves narrowly linear, to 6 cm long and 1.5-2.5 mm broad, glabrescent, or blades and lower sheaths puberulent; ligules ca. 2 mm long, oblong. Panicles few-flowered, pyramidal, loose, 5.5-11 cm long and to 9 cm broad, branches scabrous, to 5 cm long, arranged in twos, each bearing 2-4 spikelets; spikelets 4-5 mm long and 2-3 mm broad, lanceolate, 3-4-flowered, variegated; glumes ca. 3-3.5 mm long, lanceolate, unequal; lemmas lanceolate, obscurely nerved, puberulent in lower part, with longer hairs on the nerves and keel, webbed at the base. September. (Plate XXX, Figure 20, a).

Borders of streams and lakes. -Arctic: Arct. Sib. Endemic. Described from the basin of Taimyrskii Lake, the lower part of the slope on the bank of Yamu-Tarid. (13 September 1928, No 834, A.I. Tolmachev). Type in Leningrad.

Series 12. *Alpinae* Roshev. -Lemmas quite glabrous, or pubescent on the nerves, more rarely pubescent on the internerves; web always lacking. Alpine or arctic plants. All over the Union.

73. *P. alpina* L. Sp. pl. (1753) 67; Griseb. in Ldb. Fl. Ross. IV, 370; Shmal'g. Fl. II, 636; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 287. -*P. imeretica* Som. et Lev. Nuov. Giorn. Bot. Ital. (1897) 210. -*l.c.*: Rechb. Ic. Fl. Germ. I, tab. 83, fig. 1625-1628. -*Exs.*: Kneucker, Gram. exs. No 273.

Perennial. Tufted; rhizomes short; culms 5-50 cm tall, glabrous, smooth, more or less thickened at the base owing to enveloping sheaths; leaves linear, short-acuminate, rather thick, flat, 2-3 mm broad, more rarely to 5 mm (*f. latifolia* Pohle), smooth, basal leaves short, numer-

ous (f. *brevifolia* Gaud.) or rather long (f. *longifolia* Pohle); ligules to 4 mm long. Panicles to 7 cm long, dense, ovoid, short-branched, more or less motley-colored; spikelets broadly ovate, 5-7 (-10) mm long, 3-5(-7)-flowered; glumes broad, about equal, short-pointed at the tip; lemmas rather obscurely nerved, glabrous, silky-pubescent only on the keel and marginal nerves, not webbed. Spikelets occasionally proliferous (var. *vivipara* L.). July-September. (Plate XXXI, Figure 1).

Arctic and alpine tundras and meadows. -Arctic: Arct. Eur., Nov. Zem., Arct. Sib., Chuk.; European part: Kar.-Lap., Dv.-Pech., Volg.-Kam. (Ural'sk. Range); Caucasus: Ciscauc., Dag., East. and South. Transcauc.; West. Siberia: Ob., Alt.; East. Siberia: Yenis., Ang.-Sayan;

Centr. Asia: Dzung.-Tarb., Pam.-Al., Tyan'-Shan. Gen. Distr.: Arct. Scand., Centr. Eur., Balk.-As. Min., Dzung.-Kashg., Tibet, N.

Am. Described from Lapland. Type in London.

- 412 ECONOMIC IMPORTANCE. Readily eaten by reindeer; in the south one of the best mountain-pasture plants for all kinds of livestock.

74. *P. abbreviata* R. Br. in Parry. Voy. Supp. (1823) 287; Griseb. in Ldb. Fl. Ross. IV, 377. -Ic.: Lynge Vasc. Pl. Zemiya (1923) 113, tab. XLV 5, XLVII 9, 10. [shortened].

Perennial. Densely tufted; culms 7-10 cm tall, slender, glabrous, smooth; leaves narrowly linear, setaceous-twisted, glabrous; ligules pointed, to 2 mm long. Panicles dense, 1-2 cm long, short-branched; spikelets ovate, 2-4-flowered, 5-7 mm long, rather dark purple; glumes lanceolate, the lower shorter than the upper; lemmas broadly lanceolate, rather obscurely nerved, hyaline at the summit, densely pubescent in lower part to 3/4 of its length, not webbed. July-September. (Plate XXXI, Figure 2, a).

Arctic tundras. -Arctic: Nov. Zem. Gen. Distr.: Arctic. Described from Arct. north America. Type in London, cotype in Leningrad.

75. *P. Alberti* Rgl. in A. H. P. VII (1880) 611. -*P. Alberti* var. *triflora* Rgl. l. c., 612. -*P. Alberti* var. *biflora* Rgl. l. c., ex parte. -*P. attenuata* var. *versicolor* Rgl. in A. H. P. VII (1880) 609. -*P. nudiflora* Hack. in Oesterr. Bot. Zeitschr. LII (1902) 453.

Perennial. Densely tufted; rhizome short-creeping; culms 6-20 (-35 f. *elatior* Roshev.) cm tall, rigid, glabrous, rather scabrous, surrounded at the base with numerous sheaths of old leaves; leaves narrowly linear, to 1.5 mm broad, folded or [sic] somewhat scabrous; ligules 1-2 mm long. Panicles usually dense, oblong or narrow, 2-4 cm long, the short, scabrous branches arranged in twos or threes; spikelets lanceolate, 3.5-4.5 mm long, 2-3-flowered, purple or variegated; glumes subequal, 2-3 mm long; lemmas rather obscurely nerved, narrowly lanceolate, pubescent on the keel and lateral nerves, glabrous elsewhere, not webbed. June-July. (Plate XXXI, Figure 3).

High-mountain steppes. -Centr. Asia: Dzung.-Tarb., Pam.-Al., Tyan'-Shan. Gen. Distr.: Dzung.-Kashg. Described from Dzshungarsk. Alatau and Tyan'-Shan. Type in Leningrad.

76. *P. caucasica* Trin. in Mém. Acad. Sc. Pétersb., sér. 6. I (1831) 378; Griseb. in Ldb. Fl. Ross. IV, 373.

Perennial. With creeping rhizomes or stoloniferous; loosely tufted; culms 10-30 cm tall, ascending, glabrous, smooth, leafy; leaves narrowly linear, the basal ones ca. 1.5-2 mm broad, long, often folded, those

of the culms short, somewhat broader, glabrous, smooth; ligules to 1.5 mm long, oblong. Panicles few-flowered, pyramidal, the spreading, smooth, slender branches arranged in twos to threes; spikelets broadly lanceolate, 3-4-flowered, ca. 5 mm long, greenish-mottled; glumes unequal, scabrous on the keel; lemmas rather obscurely nerved, narrowly lanceolate, minutely pubescent on the keel and lateral nerves, glabrous elsewhere, not webbed. July. (Plate XXXI, Figure 4).

Alpine mountain zone. -Caucasus: Ciscauc. Endemic. Described from Mount Yungushi, 2,600 m (July 1829, S. A. Meier). Type in Leningrad.

77. *P. naltchikensis* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

Perennial. Rhizome short-creeping; culms 18-27 cm tall, ascending, slender, glabrous, smooth; leaves narrowly linear, subfiliform, 0.3-0.5 mm broad, flat or folded, glabrous, smooth; ligules to 3 mm long, pointed. Panicles pyramidal, open, few-flowered, to 5 cm long and to 5 cm broad, the glabrous branches to 2.5 cm long, arranged in twos (or threes); spikelets 5.5-6.5 mm long, 2-3-flowered, with a reddish-golden tip; glumes narrowly lanceolate, unequal, 2.5 and 3.5 long respectively; lemmas narrowly lanceolate, obscurely nerved, puberulent on the keel and lateral nerves, glabrous elsewhere, not webbed. July. (Plate XXXI, Figure 5).

Alpine zone. -Caucasus: Ciscauc. Endemic. Described from Nal'chik distr. Rtsyvashti Glac. (29 July 1893, V. Lipskii). Type in Leningrad.

78. *P. pseudoabbreviata* Roshev. in Not. syst. Herb. Horti Petropol. III (1922) 91.

Perennial. Densely tufted; culms glabrous, 5-8 cm tall, with numerous, narrowly linear, folded leaves at the base; ligules 1.5-2 mm long, lacerate. Panicles 1.5-2 cm long, unevenly pyramidal, few-flowered, with finely pilose branches; spikelets long-pedicelled, 4 mm long and 3 mm broad, 4-flowered, purple; glumes subequal, glabrous; lemmas rather obscurely nerved, glabrous, puberulent only on the nerves, in lower part, not webbed. July. (Plate XXXI, Figure 6, a).

Bare Siberian hills. -East. Siberia: Ang. -Sayan. Endemic. Described from Tunkinskii Raion in Sayanskii Mountains, Garganskii Pass (July 1902, V. Komarov). Type in Leningrad.

79. *P. Tanfiljewi* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, sér. 1, II (1934).

Perennial. Sometimes tufted; rhizome rather long; culms ascending, 40-60 cm tall, glabrous, smooth, leafy; leaves linear-acuminate, to 2 mm broad, glabrous, scaberrulous on the upper surface, flat, with glabrous, slightly scabrous sheaths; ligules 0.5-1.0 mm long, obtuse. Panicles oblong, 5-11 cm long, not dense, branches prominently scabrous, to 5 cm long; spikelets broadly lanceolate, 3.5-5.5 mm long, 2-5-flowered, acute, golden-tipped; glumes subequal, lanceolate, acute; lemmas obscurely nerved, silky-ciliate on the keel and lateral nerves, glabrous elsewhere, with pubescent rachilla, but not webbed. August. (Plate XXXI, Figure 7).

Sandy river banks. -Arctic: Arct. Eur. Endemic. Described from Timanskaya Tundra. Type in Leningrad.

80. *P. udensis* Trautv. et Mey. in Middend. Reise I, 2 (Fl. Ochot.) (1856) 103.

Perennial. Roots fibrous; culms 14-18 cm tall, glabrous, smooth; leaves narrowly linear, acuminate, 1-1.5 mm broad, flat, smooth, those of the culm strongly spreading, often subhorizontal; ligules 2-3 mm long.

Panicles contracted, 4-7 cm long and ca. 10-15 mm broad, branches scabrous, arranged in lower part of the inflorescence in twos or threes; spikelets ovate-elliptical, 4-6 mm long, 3-5-flowered, green; glumes lanceolate, acute, subequal; lemmas rather obscurely nerved, with short silky hairs on the keel and marginal nerves, not webbed at the base. (Plate XXXI, Figure 8, a).

River banks. -Far East: Ud. Endemic. Described from estuary of Uda River (Middendorff). Type in Leningrad.

Series 13. Pamiricae Roshev. -Lemmas always distinctly nerved and webbed at the base. High-mountain alpine plants of Pamiro-Alai and Tyan'-Shan.

81. *P. pamirica* (Litw.) Roshev. sp. nova in Addenda p. 754. -
Poa alpina var. *pamirica* Litw. in Herb. Ac. Sc. URSS.

Perennial. Plant with extensively creeping rhizomes; culms more or less ascending, covered at the base with sheaths of old leaves (but not thickened), glabrous, smooth; leaves flat, linear, short-acuminate, to 4 mm broad, glabrous, smooth; ligules broad, to 4 mm long. Panicles oblong-pyramidal, dense, branches divergent or even reflexed smooth; spikelets large, 5-6 mm long, broadly lanceolate, 3-4-flowered, variegated or purplish; glumes somewhat unequal, the upper larger than the lower; lemmas obscurely nerved, densely pubescent on the keel and lateral nerves, glabrous elsewhere, webbed at the base. July. (Plate XXXI, Figure 10).

Alpine meadows. -Centr. Asia: Pam. -Al. Endemic. Described from Pamir from Kizyl-rabat River (tributary of Aksu), 4,200 m (B. Alekseenko). Type in Leningrad.

82. *P. calliopsis* Litw. sp. nova in Addenda p. 755.

Perennial. Rhizomes long, extensively creeping; culms 5-10 (-15) cm tall, glabrous, smooth, leafless in upper part; leaves narrowly linear, to 2 mm broad and 2-4 cm long, terminating in a spiny point, glabrous, folded; ligules to 3 mm long. Panicles pyramidal, 2-3 cm long, with spreading or even reflexed branches; spikelets 3.5-4 mm long, ovate, 2-3-flowered, variegated; glumes ovate, the lower narrower than the upper, ca. 2.5 mm long; rachilla glabrous; lemmas ovate, obtuse, 3-4 mm long, hyaline in upper part, distinctly nerved, glabrous, long-silky-pubescent only on the keel and lateral nerves, scantily webbed at the base. July. (Plate XXXI, Figure 11, a).

415 Alpine zones, borders of streams and lakes. -Centr. Asia: Pam. -Al. , Tyan'-Shan. Endemic. Type in Leningrad.

Series 14. Dshungaricae Roshev. -Spikelets broadly lanceolate or ovate. Lemmas obscurely nerved; web at base nearly always lacking. Alpine plants of central Asia.

83. *P. dshungarica* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 776. -*P. cenisia* auct. ex parte.

Perennial. Densely tufted; roots fibrous. Culms 20-65 cm tall, more or less erect, glabrous, smooth; leaves to 2-3 (-5) mm broad, flat or somewhat folded, glabrous, smooth; ligules on basal leaves very short, on cauline leaves to 3-4 mm long. Panicles pyramidal or more or less oblong, 5-12 cm long, loose, with branches to 6 cm long; spikelets 6-8 mm long, broadly lanceolate, 3-5-flowered, more or less purplish; glumes long, broadly lanceolate, 3-5-flowered, more or less purplish; lemmas obscurely nerved, ca. 4 mm long, the upper larger than the lower; lemmas obscurely nerved, glabrous, puberulent only on lower part of the nerves, not webbed. June-August. (Plate XXXI, Figure 12).

Alpine meadows. -Centr. Asia: Dzung. -Tarb., Pam. -Al., Tyan'-Shan. Gen. Distr.: Dzung. -Kashg. Described from Dzhungarsk. Alatau. Type in Leningrad.

84. *P. disiecta* Ovcz. in Izv. Tadzhihist. Bazy Akad. Nauk (Rep. Tadzhihist. Base of Acad. Sci. USSR) I, 1 (1933) 25.

Perennial. Densely tufted; culms 20-40 cm tall, numerous, slender, glabrous, smooth, almost leafless, surrounded at the base by sheaths of old leaves; leaves linear-subulate, to 1 mm broad, glabrous; ligules 1-1.3 mm long, rounded-obtuse. Panicles loose, often more or less pend-ent, with smooth, spreading branches 2.5-4 cm long; spikelets 5-7 mm long, oblong-lanceolate, 3-4-flowered, dense, more or less purplish; glumes unequal, lanceolate, acute, the lower 1-nerved, the upper 3-nerved; lemmas rather obscurely nerved, webbed at the base, pilose on the keel and lateral nerves in lower part, glabrous elsewhere or short-pubescent on the internerves, hyaline-margined, serrate at the summit; anthers yellow, 1-1.5 mm long. October.

Slopes in the alpine zone. -Centr. Asia: Pam. -Al. Described from Zeravshanskii Range. Endemic. Type in Leningrad.

85. *P. bedeliensis* Litw. sp. nova in Addenda p. 755.

Perennial. Culms 15-25 cm tall, erect, glabrous, leafy up to the middle, surrounded at the base by sheaths of old leaves and innovations; leaves linear-acuminate, 1-2 mm broad, glabrous, more or less folded; ligules to 2.5 mm long. Panicles few-flowered, 3-5 cm long, branches to 2 cm long, arranged in twos; spikelets ca. 5-5 mm long, 416 2-3-flowered, variegated or rather dark purple; glumes lanceolate, sub-equal, ca. 4 mm long, the lower 1-nerved, the upper 3-nerved; rachilla glabrous; lemmas rather obscurely nerved, puberulent in lower part, with longer hairs on the keel and lateral nerves, scantily webbed at the base. July. (Plate XXXI, Figure 13).

High-mountain meadows. -Centr. Asia: Tyan'-Shan near Bedel' Pass (3 July 1908, No 348. D. Divnogorskaya). Endemic. Type in Leningrad.

86. *P. hissarica* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

Perennial. Often forming compact tufts; rhizome short-creeping. Culms 15-40 cm tall, smooth, leafless in upper part, with numerous leaves, sheaths of old leaves, and innovations at the base; leaves narrowly linear, to 2 mm broad, flat or somewhat folded, glabrous, rather scabrous on the upper surface; ligules to 1 mm, obtuse. Panicles loose, pyramidal in anthesis, 5-10 cm long, the smooth branches to 5 cm long; spikelets 7-10 mm long, 3-6-flowered, rather pale purple; glumes somewhat un-equal, the upper broader than the lower; lemmas obscurely nerved, entire-ly glabrous, not webbed. June-July. (Plate XXXI, Figure 14).

High mountain slopes, 3,000-4,000 m above sea level. -Centr. Asia: Pam. -Al. Endemic. Described from Gissarskii Range. Type in Lenin-grad.

87. *P. acuminata* Ovcz. in Izv. Tadzhihist. Bazy Akad. Nauk (Rep. Tadzhihist. Base of Acad. Sci. USSR) I, 1 (1933) 25.

Perennial. Densely tufted; with fibrous roots; culms to 38 cm tall, geniculate-ascending or erect, glabrous, scabrous, surrounded at the base by short, brownish sheaths of old leaves; leaves to 1 mm broad, more or less involute or flat, linear, nearly smooth or scabrous;

sheaths smooth, longer than the internodes; ligules to 2 mm long, oblong. Panicles oblong, to 6-7 (8) cm long, loose, contracted, branches short, unequal, 0.6-1 cm long, stiff; spikelets oblong-elliptical, 6-7 mm long, 4-5-flowered, purple; glumes lanceolate, acute, glabrous, more or less purplish on the margin; lemmas rather obscurely nerved, entirely glabrous; acuminate, serrate at the summit, variegated; anthers oblong, to 2 mm long, August.

Mountain-slopes of the alpine zone. -Centr. Asia: Pam. -Al. Endemic. Described from Shugnan. Type in Leningrad.

88. *P. karateginensis* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

Perennial. Loosely tufted; culms 18-25 cm tall, slender, glabrous, smooth, ascending, with a small number of old leaf sheaths and innovations at the base; leaves linear-acuminate, 1-1.5 mm broad, flat, glabrous, smooth; ligules not exceeding 0.5 mm or none. Panicles 3-6 cm long, 417 pyramidal, few-flowered, with branches to 2 cm long; spikelets 4-7 mm long, 2-4-flowered, rather dark purple; glumes broadly-lanceolate, hyaline-margined, somewhat unequal; lemmas rather obscurely nerved, entirely glabrous, not webbed, August.

Alpine mountain zone. -Centr. Asia: Pam. -Al. Endemic. Described from Tadzhikistan (Karategin, Karashibat Glacier) 3,000 m. Lipskii 1896). Type in Leningrad.

89. *P. Gorbunovii* Ovcz. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

Perennial. Plants forming compact tufts, with few short stolons; culms 13-25 cm tall, slender, glabrous; leaves short, to 1.0-2.5 mm broad, glabrous, flat; ligules to 1-1.2 mm long, obtuse, serrate. Panicles erect, contracted, rather dense, with upright, glabrous branches; spikelets to 8 mm long, lanceolate, 4-6-flowered, more or less purplish-green; glumes unequal, 2-3 mm long, oblong-lanceolate, glabrous; lemmas rather obscurely nerved, glabrous, not webbed at the base, 3-3.5 mm long, oblong-lanceolate; palea 2-3 mm long, slightly emarginate at the summit, minutely ciliate on the keels in upper part; anthers to 1.5 mm long. October.

Alpine meadows. -Centr. Asia: Pam. -Al. Endemic. Described from Tadzhikistan, from Khrebet Petra Velikogo [Peter the Great Range]. Type in Leningrad.

90. *P. Litwinowiana* Ovcz. in Izv. Tadzhikist. Bazy Ak. Nauk (Rep. Tadzhikist. Base of Acad. Sci.) I, 1 (1933) 22. -*P. seorsa* Litw. in sched. -*P. ruida* Litw. in mss. ex parte. -*P. attenuata* auct. Fl. Turk. ex parte.

Perennial. Densely tufted, with fibrous roots; culms 14 cm tall, more rarely 30-35 cm (*f. elongata* Ovcz.), glaucous, scabrous in upper part, with brownish sheaths of old leaves at the base; leaves linear, 1-1.5 mm broad, often involute, or flat, acuminate; ligules 1.5-1.6 mm long, oblong. Panicles 3-4 cm long, oblong; branches unequal, prominently scabrous, 3-10 mm long; spikelets 2-4-flowered, 4-5 (6) mm long, grayish-purple; glumes unequal, ovate-lanceolate, acute, more or less purplish, glabrous or ciliate on the keel; lemmas rather obscurely nerved, not webbed at the base, subobtuse or serrate at the summit, glabrous or appressed-hairy on the keel and lateral nerves, with a white or yellowish-brown hyaline margin. Anthers purple or yellow, 1.5-2 mm long. July.

Alpine zone, stony places. -Centr. Asia: Pam. -Al. Described from Zerafshanskii Range. Type in Leningrad.

91. *P. marginata* Ovcz. in Izv. Tadzhiikist. Bazy Ak. Nauk (Rep. Tadzhiikist. Base of Acad. Sci.) I, 1 (1933) 24.

- 418 Perennial. Tufts compact, with fibrous roots; culms 16-35 cm tall, erect, ribbed, scabrous in upper part; leaves linear, 1-2 mm broad, acuminate, flat or involute, scabrous; ligules 1.5-2 mm long, oblong, with extended tip. Panicles 5-8 cm long, rather loose, broadly-oblong in anthesis, branches 1.5-6.0 cm long, prominently scabrous; spikelets 7-8 mm long, 6-7-flowered, ovate-lanceolate or oblong-lanceolate, variegated; glumes subequal, lanceolate, acute, more or less purplish, glabrous, with small bristles on upper part of the keel; lemmas rather obscurely nerved, not webbed at the base, acute, serrulate at the tip, with silky hairs on the keel and marginal nerves, and with a white or yellowish-brown, hyaline margin; anthers to 2.1 mm long. August.

Alpine meadows. -Centr. Asia: Pam. -Al. Endemic. Described from Zerafshanskii Range. Type in Leningrad.

92. *P. densissima* Roshev. in Izv. Tadzhiikist. Bazy Ak. Nauk (Rep. Tadzhiikist. Base of Acad. Sci.) I, 1 (1933) 26.

Perennial. Tufts compact, with fibrous roots; culms 4-8 (-13) cm tall, erect, firm, leafless in upper part; leaves narrowly linear, to 0.5 cm broad, partly folded, hooded at apex, scabrous on the margin; ligule 1-1.5 mm long, oblong. Panicle 1-2 (3) cm long, oblong, contracted, with short, scabrous branches; spikelets 4-5 mm long, 2-4-flowered, lanceolate, acute, subequal; lemmas rather obscurely nerved, glabrous or nearly so, more rarely puberulent in lower part (f. *pubiflora* Roshev.), with short silky hairs on the keel and lateral nerves, not webbed at the base; anthers linear, yellow, 1.5-1.7 mm long. July-August. (Plate XXXI, Figure 9, a).

Alpine meadows. -Centr. Asia: Pam. -Al. Endemic. Described from Pamir. Type in Leningrad.

93. *P. laudanensis* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934).

- 421 Perennial. Densely tufted, with fibrous roots and short stolons; culms 10-15 cm tall, erect, glabrous, smooth, surrounded at the base with sheaths of old leaves; leaves radical, numerous, narrowly linear, 1-1.5 mm broad, glabrous, flat or partly involute; ligules ca. 1 mm long, obtuse. Panicles oblong, 3-5 cm long, rather contracted, with branches to 2 cm long; spikelets 5-6 mm long, 3-4-flowered, whitish or faintly purplish; glumes of about same length, but the upper much broader than the lower; lemma obscurely nerved, quite naked, not webbed. (Plate XXXI, Figure 15).

Alpine steppe. -Centr. Asia: Pam. -Al. Endemic. Described from Laudan Pass. Type in Leningrad.

94. *P. tremuloides* Litw. sp. nova in Addenda p. 756.

Perennial. Tufts dense; rhizome short-creeping; culms 10-20 cm tall, glabrous, weak, surrounded at the base by sheaths of old leaves and sterile shoots, almost leafless in upper part; leaves soft, narrowly linear, long-acuminate, flat, 1-1.5 mm broad, the upper ones to 5 cm long, glabrous; ligules ca. 2 mm long, obtuse. Panicles narrow, 2-5 cm long and ca. 1 cm broad, the short, scabrous branches to 1.5 cm long, arranged singly or in twos and bearing 1-2 spikelets each; spikelets lanceolate,

5-7 mm long, 3-4-flowered, green or slightly purplish; glumes narrowly linear, 3-nerved, subequal, ca. 3-3.5 mm long; lemmas ca. 4 mm long, narrowly lanceolate, rather obscurely nerved, very slightly pubescent on the keel and lateral nerves, glabrous elsewhere, not webbed. July.

Stony slopes. -Centr. Asia: Pam. -Al. Endemic. Described from Pamir (Ak-su River). Type in Leningrad.

95. *P. Lipskyi* Roshev. Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 303. -*P. cenisia* auct. ex parte. -*P. macrocalyx tianschanica* Rgl. in A. H. P. VII (1880) 618 ex parte.

Perennial. Densely tufted, with fibrous roots; culms (15-) 30-50 cm tall, glabrous, smooth, leafy; leaves linear, 2-4 mm broad, glabrous, smooth underneath, more or less scabrous on the upper surface, flat or folded; ligules to 4 mm long. Panicles loose, 5-14 cm long and 8 cm broad, with branches to 7 cm long; spikelets ovate-lanceolate, 6-8 mm long, 3-5 (6)-flowered, more or less purplish, rarely green; glumes 3-5 mm long, the upper larger than the lower; lemmas rather obscurely nerved, more or less pubescent in lower part, not webbed at the base. June-August. (Plate XXXI, Figure 16).

Alpine meadows and stony slopes. -Centr. Asia: Dzung. -Tarb., Pam. -Al., Tyan'-Shan. Endemic. Described from Dzhungarskii Alatau. Type in Leningrad.

96. *P. Fedtschenkoi* Roshev. Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 297.

Perennial. Loosely tufted; roots fibrous; culms 40-50 cm tall, glabrous, smooth; leaves to 4 mm broad, glaucous, smooth underneath, more or less scabrous on the upper surface; ligules oblong, 2-2.5 mm long. Panicles narrow, dense, 5-7 cm long and 1-2 cm broad, with branches 422 0.2-3 cm long; spikelets ca. 7 mm long, ovate, 3-6-flowered, whitish-green, purplish only at the tip; glumes lanceolate, ca. 3 mm long, the upper larger than the lower; lemmas distinctly nerved, glabrous, puberulent only on the nerves in lower part, not webbed. July. (Plate XXXI, Figure 17).

Mountain bogs. -Centr. Asia: central Tyan'-Shan, Kungei Alatau Range, between Dyure and Turaigyr station (3 July 1908, No 1016. B. Fedchenko). Endemic. Type in Leningrad.

Series 15. *Malacanthae* Roshev. -Spikelets large, ca. 7 mm long, broadly lanceolate, rather distinctly nerved and copiously webbed at the base. A subalpine or tundra plant. East, Siberia and Far East.

97. *P. Komarovi* Roshev. Bull. Jard. Bot. Ac. Sc. URSS, XXVI, 3 (1927) 286.

Perennial. Tufted, with fibrous roots and small rhizomes; culms 10-35 cm tall, glabrous, smooth, surrounded at the base with sheaths of old leaves; leaves narrowly linear, 2-4 mm broad, flat or somewhat folded; ligules 2-3 (4) mm long. Panicles open, rarely oval, 4-9 cm long and to 6 cm broad, with branches 3.5 cm long; spikelets 5-8 mm long and to 6 mm broad, lanceolate, 4-6-flowered, more or less variegated; glumes lanceolate, subequal; lemmas distinctly nerved, puberulent in lower part, with long silky pubescence on the nerves, webbed at the base. May-August. (Plate XXXI, Figure 18).

Alpine zone, meadows, screes, and stony places. -Arctic: Chuk.; Far East: Kamch. Endemic. Described from Kamchatka. Type in Leningrad.

98. *P. bracteosa* Kom. in Not. Syst. Herb. Horti Bot. Petropol. V (1924) 147.

Perennial. Tufts dense; rhizome creeping; culms ca. 20 cm tall, glabrous, smooth, surrounded at the base with sheaths of old leaves; leaves linear, to 2 mm broad, the basal numerous, mostly folded, 5-10 cm long, the cauline shorter; ligules ca. 1 mm long. Panicles loose, pyramidal, 4-5 cm long, with a hyaline bract, 3-4 mm long, at the base the smooth branches 2-2.5 cm long; spikelets ca. 6 mm long, lanceolate, 2-5-flowered, purplish; glumes lanceolate, unequal; lemmas broadly lanceolate, hyaline-margined, obscurely nerved, glabrous, puberulent only on the keel and lateral nerves, webbed at the base. Anthers 2-2.5 mm long. July.

Stony, alpine tundra. -Far East: Kamch. Endemic. Described from the valley of the rivulet Gremuchei, in Avach River basin. Type in Leningrad.

99. *P. malacantha* Kom. in Not. Syst. Herb. Hort. Bot. Petropol. V (1924) 149.

- 423 Perennial. Not tufted rhizomes short; culms 15-20 cm tall, glabrous, smooth; leaves narrowly linear, to 2 mm broad and up to 10-12 cm long, glabrous, scabrous on the upper surface; ligules to 4 mm long, lacerate at the tip. Panicles oval, loose, 5-10 cm long, few-flowered, pale, the slender, smooth branches to 5 cm long; spikelets flat, slender, 5-6 mm long and 6-7 mm broad in anthesis, 2-3-flowered; glumes lanceolate, 4-4.5 mm long, subequal; lemmas obscurely nerved, puberulent, with longer, silky hairs on the keel and marginal nerves, webbed at the base. June-August. (Plate XXXI, Figure 20).

Subalpine meadows. -Far East: Kamch. Endemic. Described from Kashkan River, near the village of Pushchina (Komarov). Type in Leningrad.

NOTE. A species closely allied to *P. platynatha*, from which it differs chiefly in smaller size.

100. *P. platyantha* Kom. in Not. Syst. Herb. Horti Bot. Petropol. V (1924). 148. -*Poa lanata* Kom. (non Scr. et Merr.) Fl. Kamch. I (1927) 170 ex parte.

Explanation to Plate XXXI

1. *Poa alpina* L., spikelet. -2. *P. abbreviata* R.Br., inflorescence. -3. *P. Alberti* Rgl., spikelet. -4. *P. caucasica* Trin., spikelet. -5. *P. naltchikensis* Roshev., spikelet. -6. *P. pseudobreviata* Roshev., general view, a) spikelet. -7. *P. Tanfiljewi* Roshev., spikelet. -8. *P. udensis* Trautv. et Mey., inflorescence, a) spikelet. -9. *P. densissima* Roshev., inflorescence, a) spikelet. -10. *P. pamirica* (Litw.) Roshev., spikelet. -11. *P. calliopsis* Litw., inflorescence, a) spikelet. -12. *P. dachungarica* Roshev., spikelet. -13. *P. bedeliensis* Litw., spikelet. -14. *P. hissarica* Roshev., spikelet. -15. *P. laudanensis* Roshev., spikelet. -16. *P. Lipskyi* Roshev., spikelet. -17. *P. Fedtschenkoi* Roshev., inflorescence, a) spikelet. -18. *P. Komarovi* Roshev., spikelet. -19. *P. bracteosa* Kom., inflorescence, a) spikelet. -20. *P. malacantha* Kom., spikelet. -21. *P. platyantha* Kom., spikelet.



Perennial. Forming loose tufts; rhizome short-creeping; culms 30-40 (-60) cm tall, glabrous, smooth, surrounded at the base to varying extent with sheaths of old leaves; leaves narrowly linear, long-acuminate, to 4 mm broad, flat, the basal to 20 cm long, the cauline shorter, glabrous, slightly scabrous on the upper surface; ligules 3-4 mm long. Panicles oblong or pyramidal, loose, 11-13 cm long, the smooth branches 1-5 cm long; spikelets broadly lanceolate, ca. 6 mm long, 3-5-flowered, more or less variegated; glumes lance-acuminate, somewhat unequal; lemmas broadly lanceolate, obscurely nerved, puberulent in lower part, with longer, silky hairs on the keel and lateral nerves, webbed at the base. A proliferous form occurs (f. *vivipara* Kom.). May-July. (Plate XXXI, Figure 21).

Dry forest glades and riverside pebbles. -Far East: Kamch. Endemic. Described from Nikolskaya Mountain. Type in Leningrad.

101. *P. trivialiformis* Kom. in Not. Syst. Herb. Horti Bot. Petropol. V (1924) 150. -*P. lanata* Kom. Fl. Kamch. I (1927) 170, ex parte, non Scr. et Merr.

Perennial. Tufts loose; stoloniferous; culms 30-80 cm tall, erect, glabrous, smooth; leaves linear-acuminate, glabrous, smooth underneath, scabrous on the upper surface; ligules ca. 4 mm long, subobtus. Panicles loose, subpyramidal, 10-15 cm long, the slender, smooth branches to 10 cm long; spikelets broadly lanceolate, ca. 7 mm long, 3-5-flowered, pale green, 4-5 mm long, the lower 1-nerved, the upper 3-nerved; lemmas lanceolate, distinctly nerved, pubescent, with long silky hairs on the keel and marginal nerves, webbed at the base. July-August.

424 Meadows, grassy slopes, and gravels at the side of water bodies. -Far East: Kamch. Endemic. Described from Bolshaya River, near the village of Nachika. Type in Leningrad.

102. *P. macrocalyx* Trautv. et Mey. in Middend. Sib. Reise I, 2 (1856) 103.

Perennial. Rhizome short-creeping; culms 60-80 cm tall, erect, glabrous, smooth; leaves 2-5 mm broad, linear, glabrous, scabrous on the keel and nerves; ligules on upper leaves to 5 mm long, on lower ones short. Panicles 6-20 cm long, oblong, the scabrous branches to 6 cm long; spikelets 5-8 mm long, broadly lanceolate, 3-5-flowered, light green, whitish or slightly brownish; glumes lanceolate, acute, equal, large, attaining $3/4$ the length of spikelet, scabrous on the keel; lemmas distinctly nerved, puberulent, with longer silky hairs on the keel and marginal nerves, webbed at the base. June-September. (Plate XXXII, Figure 1, a).

Sea coast. -Far East: Kamch., Ud., Ussur., Sakh. Gen. Distr.: Jap.-Chin., N. Am. (?). Described from De-Kastri Bay. Type in Leningrad.

103. *P. petrae* Trin. nomen in herb. Ac. Sc. USSR et descript. in Kom. Fl. Kamch. I (1927) 173.

Perennial. Usually not tufted; rhizome short-creeping; culms 20-40 cm tall, glabrous, smooth, scantily leafy; leaves narrowly linear, 2-4 cm long and 2-3 mm broad, rather flat; ligules ca. 2 mm long. Panicles oblong, 5-7 cm long and 3-3.5 cm broad, with slender, smooth branches; spikelets broadly ovate, 6-8 mm long and 5 mm broad, 3-4 (5)-flowered, more or less purplish; glumes broadly lanceolate, acute, subequal; lemmas broadly lanceolate, obscurely nerved, rather densely pubescent, with longer hairs on the keel and marginal nerves, webbed at the base.

Stony tundra. -Far East: Kamch. Endemic. Described from Karaginskii Island (Mertens). Type in Leningrad.

NOTE. Very closely allied to *Poa platyantha* Kom.

104. *P. smirnowii* Roshev. Bull. Jard. Bot. Princ. XXVIII (1929) 381.

Perennial. Rhizomatous, loosely tufted; culms 25-40 cm tall, erect, smooth; leaves linear, flat, to 4 mm broad; ligules obtuse, ca. 3 mm long. Panicles pyramidal, 5-8 cm long; spikelets 2-4-flowered, 5-7 mm long, more or less purplish; glumes unequal, the lower 1-nerved, the upper 3-nerved, hyaline-margined; lemmas hyaline-margined, puberulent in lower part, with long hairs on the nerves, copiously webbed at the base. August. (Plate XXXII, Figure 2, a).

425 Wet sandy deposits along little streams. -East. Siberia: Ang. -Sayan. (Tunkinskii gol'tsy [bare Siberian hills], sources of Tunka River, 2,000 m. V. Smirnov). Endemic. Type in Leningrad.

Series 16. *Crassiculmae* Roshev. -Plants with stout culms and stiff, broad leaves. Spikelets large, 8-10 mm long, obscurely nerved, not webbed.

105. *P. tibetica* Munro, ex Duthie Grass. N.W. Ind. p. 41. -*Poa macrocalyx* β *tianschanica* Rgl. in A. H. P. VII (1880) 619. -*Poa tianschanica* (Rgl) Hack. in O. Fedsch. Fl. Pam. (1903) 209.

Perennial. Rhizomes creeping, short; culms suberect, 20-90 cm tall, to 3 mm thick, glabrous, smooth; leaves linear, hard, 2-5 mm broad, flat or more or less folded, glabrous, smooth underneath, scabrous on the upper surface; ligules short, obtuse. Panicles rather dense, contracted, with short, appressed branches, to 12 cm long and to 3 cm broad; spikelets ovate, 4-8 mm long, 3-6 (8)-flowered, whitish-green or somewhat purplish; glumes broadly lanceolate, unequal, 3-5 mm long; lemmas broadly lanceolate, obscurely nerved, with cilia ca. 1 mm long on the keel and lateral nerves, glabrous elsewhere, not webbed at the base; covered with long hairs rachilla. June-August. (Plate XXXII, Figure 4, a).

Steppe slopes and stony places in alpine zone. -West. Siberia: Alt.; East. Siberia: Ang. -Sayan.; Centr. Asia: Dzhung. -Tarb., Pam. -Al., Tyan'-Shan. Gen. Distr.: Dzhung. -Kashg., Mong., Tibet. Described from Tibet. Type in London.

106. *P. subfastigiata* Trin. in Ldb. Fl. alt. I (1829) 96; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 300. -*Glyceria subfastigiata* Griseb. in Ldb. Fl. Ross. IV (1853) 392.

Perennial. Rhizome creeping, 2-3 mm thick; culms 35-120 cm tall, somewhat flattened, glabrous, smooth; leaves stiff, 2-5 mm broad, linear-acuminate, flat or more or less folded, glabrous, the nerves scabrous on the upper side; ligules to 2.5 mm long. Panicles broadly pyramidal, 15-25 cm long and 10-25 cm broad, the scaberulous branches to 10 cm long, in fascicles of 2-5. Spikelets 5-8 mm long and 2-4 mm broad, lanceolate, 3-4-flowered, green or somewhat purplish; glumes broadly lanceolate, glabrous; lemmas 4-5.5 mm long, lanceolate, rather prominently nerved, entirely glabrous, not webbed. June-July. (Plate XXXII, Figure 5, a).

Meadows and mountain slopes. -West Siberia: Alt.; East. Siberia: all regions; Far East: Ze. -Bur., Ussur. Gen. Distr.: Mong. Described from Altai. Type in Leningrad.

107. *P. eminens* Presl, Reliq. Haenkean. I (1830) 273. -*P. glumaris* Trin. in Mém. Ac. Sc. Petersb., ser. 6, I (1831) 370. -*P. rigens* Trin. in herb. Leningrad. -*Glyceria glumaris* Griseb. in Ldb. Fl. Ross. IV (1853) 392. -*P. Trinii* Scribn. et Merr. in Contr. U.S. Nat. Herb. XIII 3 (1910) 73.

Perennial. Rhizomes strong, creeping; culms to 1 mm tall, erect, robust, to 5 mm thick, sulcate, glabrous; leaves to 50 cm long and to 1 cm broad, acuminate, rather flat, prominently scabrous on the margins; ligules 1-2 mm long, ciliate on the margin. Panicles elliptical, contracted, to 20 cm long, many-flowered, with smooth, more or less appressed branches; spikelets (6) 7-9 (-12) mm long, 3-6-flowered, pale green, turning brown; glumes broadly lanceolate, long, subequal; lemmas rather obscurely nerved, minutely puberulent, with longer silky hairs on the keel and lateral nerves, not webbed at the base. July-September. (Plate XXXII, Figure 6, a).

Sea coast. -Far East: all regions except Ze.-Bur. Gen. Distr.: Jap.-Chin., N. Am. Described from the coast of Nutka Bay. Type in Prague.

Genus 168. BELLARDIACHLOA* CHIOV.

Chiov. in Stud. Veg. Piemonte (1929) 60.

Inflorescence paniculate, with prominently scabrous branches. Spikelets lanceolate, 2-6-flowered. Glumes about equal, both 3-nerved. Lemmas obscurely nerved, short-awned from the tip. Rachilla and base of lemma clothed with short hairs. Base of lemma not webbed. Stamens 3. Caryopsis oblong, bluntly 3-angled.

1. *V. polychroa* (Trautv.) Roshev. comb. nova. -*Festuca polychroa* Trautv. in A.H.P. II (1873) 485. -*Poa violacea* var. *contracta* Hack. in Herb. Leningrad. et in Grossg. Fl. Kavk. (Fl. Cauc.) I (1929) 105. -*P. violacea* var. *polychroa* Roshev. in Herb. Leningrad. et in Grossg. l.c.

Perennial. Densely tufted, with fibrous roots; culms slender, smooth, 8-20 cm tall, surrounded at the base with clusters of basal leaves of sterile shoots; leaves thin, setaceous-involute, the basal ones scarcely attaining half the length of the culm; ligules to 3 mm long. Panicles 2-5 cm long, narrow, contracted, with short, prominently scabrous branches; spikelets 3.5-4.5 mm long, 2-5-flowered, motley-purple; glumes somewhat unequal, 429 lanceolate; lemmas lanceolate, obscurely nerved, scabrous on the keel, always with a mucro or awn to 1 mm long at the summit, not webbed at the base. July-August. (Plate XXXII, Figure 3, a).

Mountain meadows. -Caucasus: West., East., and South. Transcauc. Endemic. Described from Armenia (Gr. Ararat). Type in Leningrad.

Genus 169. EREMOPOA** ROSHEV.

Roshev. in Addenda p. 756.

Inflorescence paniculate, with long branches arranged in half-whorls. Spikelets elliptical, (1) 2-many-flowered, with a geniculate, puberulent

* Named for Turin professor of botany, L. Bellardi (1741-1826).

** From Greek *eremos* - desert, and *poa* - bluegrass.

rachilla. Glumes unequal, the lower 1-nerved, the upper 3-nerved. Lemmas narrowly lanceolate, with obscure keel and lateral nerves, hyaline in upper part, pointed or short-awned, glabrous, not webbed at the base. Stamens 3. Pistil with plumose stigmas. Caryopsis united with lemma and palea, faintly grooved.

1. Plants of medium size, 10-60 cm tall 2.
- + Plants small, 2-8 cm tall 5.
2. Lemmas subobtusate, with a short mucro or awn 3.
- + Lemmas gradually tapering to a point 4.
3. Plants 30-60 cm tall. Leaves flat, to 6 mm broad. Panicle branches arranged in 9's-15's. Spikelets to 1 cm long
- 1. *E. multiradiata* (Trautv.) Roshev.
- + Plants 10-30 cm tall. Leaves narrowly linear, more or less involute. Panicle branches arranged in 7's-9's (-13's). Spikelets to 6 mm long
- 2. *E. persica* (Trin.) Roshev.
4. Culms slender; leaves to 3 mm broad. Spikelets 4-6 mm long, 3-5-flowered 3. *E. oxyglumis* (Boiss.) Roshev.
- + Culms very slender; leaves 1-1.5 mm broad; panicle very delicate, with subcapillary branches. Spikelets 3-5 mm long, 1-2 (3)-flowered
- 4. *E. soongorica* (Schrenk) Roshev.
5. Densely tufted. Culms very slender, subcapillary. Panicle narrow, contracted, with branches in 1's-3's. Lemmas long-acuminate
- 5. *E. bellula* (Rgl.) Roshev.
- + Not densely tufted; culms not capillary 6.
6. Culms solitary. Spikelets relatively large, 4-5 mm long, 2-4-flowered. Lemmas ca. 4 mm long
- 6. *E. altaica* (Trin.) Roshev.
- + Growing in bunches; culms branching at the base. Spikelets smaller, 3-5-flowered. Lemmas ca. 3 mm long
- 3. *E. oxyglumis* var. *alpina* Boiss.

430 1. *E. multiradiata* (Trautv.) Roshev. comb. nova - *Poa palustris* β *multiradiata* Trautv. in A.H.P. IV (1876) 406. - *P. multiradiata* Rgl. in A.H.P. VII (1880) 620. - *P. persica* var. *major* Grossh. Fl. Kavk. (Fl. Cauc.) I (1928) 104 ex parte.

Annual. Tufted; roots fibrous; culms 30-60 cm tall, erect, glabrous, smooth leafy; leaves linear, long acuminate, to 6 mm broad, flat, glabrous, nerves scabrous on the upper side; ligules to 4 mm long. Panicle 12-18 cm long, and to 7 cm broad, oblong, many-flowered, with numerous scabrous branches arranged in semiverticels of 9-15; spikelets oblong-lanceolate, 3-9-flowered, to 1 cm long; glumes narrowly lanceolate, the lower smaller than the upper; lemmas subobtusate or obliquely truncate, rather distinctly mucronate. May-June. (Plate XXXII, Figure 7, a).

Dry stony or sandy places. -Caucasus: South. Transcauc. (Armenia). Endemic. Described from Armenia. Type in Leningrad.

2. *E. persica* (Trin.) Roshev. comb. nova - *Poa persica* Trin. in Mém. Acad. Sc. Pétersb., ser. 6., I (1831) 373. - *Festuca polygama* C. Koch in Linnaea XXI (1848) 409. - *F. persica* C. Koch, l.c., 410. - *F. heptantha* C. Koch, l.c., 410. - *Nephelochloa persica* Griseb. in Ldb. Fl. Ross. IV, (1853) 366. - *Poa heptantha* Steud. Syn. pl. gram. (1855) 255. - Exs.: Bornmüller, R. Syriac. II, No 13006.

Annual. Roots slender, fibrous; culms 5-30 cm tall, solitary or branching at the base, slender, smooth; leaves narrowly linear, flat or subinvolute, scabrous on the upper surface; ligules to 4 mm long. Panicle oblong, loose, the slender, prominently scabrous branches arranged on the axis in 7's-13's; spikelets elliptical, to 6 mm long, 3-6 (-15) flowered, green or purplish; glumes narrowly lanceolate, unequal; lemmas subobtusate or obliquely truncate short-mucronate. May-July. (Plate XXXII, Figure 8).

Dry stony places. -Caucasus: East and South. Transcauc., Tal. Gen. Distr.: East. Medit., Balk. -As. Min., Arm. -Kurd., Iran. Described from Persia. Type in Leningrad.

3. *E. oxyglumis* (Boiss.) Roshev. sp. nova in Addenda p. 756. -
Poa persica β *oxyglumis* Boiss. Fl. Or. V (1884) 610.

Annual. Culms 15-50 cm tall, more rarely 2-3 cm (var. *alpina* Boiss.), solitary or branching at the base, slender, smooth; leaves narrowly linear, to 3 mm broad, long-acuminate, flat or folded, scabrous on the upper surface; ligules 2-3 mm long. Panicle oblong, loose, the scabrous branches arranged on the axis in 3's-7's (-10's); spikelets elliptical, 4-7 mm long, 3-5-flowered, green or somewhat purplish; glumes narrowly lanceolate, unequal; lemmas gradually acuminate, often with short-mucronate. May-July. (Plate XXXII, Figures 9, 10).

431 Dry stony or sandy places. -Caucasus: West., East, and South. Transcauc.; Centr. Asia: all regions. Gen. Distr.: Balk. -As. Min., Arm. -Kurd., Iran, Ind. -Him., Dzhung. -Kashg. Described from Armenia. Type in Leningrad.

4. *E. soongorica* (Schrenk) Roshev. comb. nov. -*Glyceria soongorica* Schrenk, Enum. Pl. nov. I (1841) 1. -*Nephelochloa soongorica* Griseb. in Ldb. Fl. Ross. IV (1853) 367. -*Poa soongorica* Boiss. Fl. Or. V (1884) 611. -*P. persica* var. *soongorica* Hook. Fl. of Br. Ind. VII (1897) 337. -*Nephelochloa persica* β *soongorica* Rgl. in. A. H. P. VII (1890) 603.

Annual. Roots fibrous; culms 10-40 cm tall, solitary, more rarely branching at the base, very slender, smooth; leaves narrowly linear, 1-1.5 mm broad, long-acuminate, more or less folded, scaberulous on the upper surface; ligules 1-1.5 mm long. Panicle oblong, loose, 4-10 (-15) cm long, the very slender, scaberulous branches arranged on the axis in 3's-14's; spikelets lanceolate, 3-5 mm long, 1-2 (3)-flowered, nearly always green; glumes narrowly lanceolate; lemmas narrowly lanceolate, gradually acuminate. May-August. (Plate XXXII, Figure 11).

Explanation to Plate XXXII

1. *Poa macrocalyx* Trautv. et Mey., inflorescence, a) spikelet. -2. *P. Smirnowii* Roshev., inflorescence, a) spikelet. -3. *Belardiachloa polychroa* (Trautv.) Roshev., inflorescence, a) spikelet. -4. *Poa tibetica* Munro, inflorescence, a) spikelet. -5. *P. subfastigiata* Trin., inflorescence, a) spikelet. -6. *P. eminens* Presl., inflorescence, a) spikelet. -7. *Eremopoa multi-radiata* (Trautv.) Roshev., inflorescence, a) spikelet. -8. *E. persica* (Trin.) Roshev., spikelet. -9. *E. oxyglumis* (Boiss.) Roshev., spikelet. -10. *E. oxyglumis* var. *alpina* (Boiss.) Roshev., general view; a) spikelet. -11. *E. soongorica* (Schrenk) Roshev., inflorescence, a) spikelet. -12. *E. belinla* (Rgl.) Roshev., general view, a) spikelet. -13. *E. altaica* (Trin.) Roshev., general view, a) spikelet.



Borders of streams, lakes and drying ponds, mainly on loam soils. - Caucasus: South. Transcauc.; West. Siberia: Upp.-Tob., Irt.; Centr. Asia: Aral.-Casp., Pribalkh. Gen. Distr.; East. Tibet (?). Described from Zaisanskaya Hollow. Type in Leningrad.

5. *E. bellula* (Rgl.) Roshev. comb. nov. - *Festuca bellula* Rgl. in A.H.P. VII (1880) 594.

Annual. Tufts dense (but not compact). Roots slender, fibrous; culms very slender, 3-8 cm tall, subcapillary, glabrous, smooth; leaves narrowly linear, ca. 0.5 mm broad, flat or folded; ligules to 1 mm long. Panicle to 2.5 cm long, very narrow, contracted, with prominently scabrous, 3-angled branches, in 1's-3's; spikelets narrowly elliptical, 4-6 mm long, 1-2 (3)-flowered, green, more or less brownish at the tip; glumes lanceolate, unequal; lemmas narrowly lanceolate, long-acuminate, obscurely nerved. July. (Plate XXXII, Figure 12).

Near water in the alpine zone. - Centr. Asia: Pamir (Sassykkul' Lake, sources of Ak-su (murgaba). - Endemic. Described from Chotkal'skii Range. Type in Leningrad.

6. *E. altaica* (Trin.) Roshev. comb. nov. - *Aira altaica* Trin. in Bge. Fl. alt. Suppl. I (1836) 8. - *Poa diaphora* Trin. in Bull. Sc. Pétersb. I (1836) 69. - *Nephelochloa altaica* Griseb. in Ldb. Fl. Ross. IV (1853) 367. - *Poa persica* var. *altaica* Kryl. in Fl. Zap. Sib. (Fl. West. Sib.) II (1928) 280.

Annual. Not tufted; culms 2-8 cm tall, solitary, slender, glabrous; leaves narrowly linear, to 1 mm broad, glabrous, folded; ligules to 2 mm 432 long. Panicle open, to 3.5 cm long, few-flowered, with scabrous branches 1-1.5 cm long, in 3's-4's; spikelets relatively large, 4-5 mm long, green or purplish; glumes lanceolate, unequal; lemmas narrowly lanceolate, ca. 4 mm long, acute, often with an awn-point to 0.5 mm long. (Plate XXXII, Figure 13).

Mountain steppes. - West. Siberia: Alt. (Chuiskaya Steppe, Chegan-Uzun.). Endemic. Described from Altai. Type in Leningrad.

Genus 170. DUPONTIA* R. BR.**

R. Br. in Parry. Voy. App. (1824) 290.

Inflorescence a rather narrow panicle, with smooth, ascending or appressed branches. Spikelets 2-3-flowered. Glumes slightly unequal, ovate-lanceolate or ovate, long-acuminate, hyaline, smooth, longer than the florets or as long as the spikelet. Lemmas oblong-ovate, glabrous or appressed-hairy in lower part, subobtusely or acuminate, with a small callus, clothed with long stiff hairs, at the base. Palea 2-keeled, with smooth keels. Lodicules ovate, pointed. Perennial with a creeping rhizome.

1. *D. Fischeri* R. Br., l.c.; Griseb. in Ldb. Fl. Ross. IV (1853) 386; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II (1928) 303. - *Poa* (Dupontia) *pelligera* Rupr. Fl. Samoj. cisural. (1845) 64. - *Dupontia psilosantha* Rupr., l.c., p. 64, tab. 6. - *Graphephorum Fischeri* A.

* Named for the botanist I. D. Dupont, who published a Flora of Paris in 1805.

** Compiled by S. A. Nevskii.

Gray. Transact. Bot. Soc. Canada (1861) 55. - *G. psilosanthum* A. Gray, l.c. - *Colpodium humile* Lange (non Griseb.) in Th. Holm, Novaya Zemlia's Vegetation (1887) 20. - C. Langei Gand. Nov. Consp. Fl. Eur. (1910) 490. - l.c.: Vasey Ill. N. Am. Grass. II, tab. 87 (1893); Ruprecht. l.c., tab. 6; Lange, l.c.

Perennial. Culms 10-40 cm tall; leaves green or somewhat glaucous-green, usually folded narrowly linear, smooth and glabrous; ligules obtuse, more or less serrate at the tip, 1-3 mm long. Panicle 3-12 (15) cm long and 0.5-1.5 (2) cm broad; spikelets dark purple, with golden-tipped bracts, more rarely greenish-purple, 5-7 mm long; lemmas much shorter (nearly by half) than the glumes, 3-4 (4.5) mm long, acute or subacute, hairy (f. *typica* Kryl.) or naked (f. *psilosantha* (Rupr.) Kryl.). July-August. (Plate XXXIII, Figure 5, a-d).

Sandy river banks in dry spotted tundras (f. *typica*), wet tundras (f. *psilosantha*). - Arctic: Nov. Zem., Arct. Eur., Arct. Sib., Chuk., Anad.; East. Siberia: Len.-Kol. Gen. Distr.: Spitsbergen, Greenland, Arct. America. Described from Arctic America.

Rupr. Fl. Samoied. cisural. (1846) 64.

Inflorescence a rather open panicle with slender, smooth, recurved or drooping branches; spikelets 2-7-flowered, somewhat laterally compressed, with rather spreading florets; glumes hyaline, subobtusely, shorter than the spikelet. At the base of each lemma there is a small callus furnished with a tuft of straight stiff hairs. Lemmas obovate, obtuse, entirely glabrous, more or less serrate at the summit. Perennial.

1. *A. fulva* (Trin.) Anders. Gram. Scand. (1852) 49. - *Poa fulva* Trin. Mém. Ac. St. Petersb. VI, 1 (1830) 378. - *Glyceria fulva* Fr. Summa veg. I (1846) 244. - *Colpodium fulvum* Griseb. in Ldb. Fl. Ross. IV (1853) 385. - *Glyceria pendulina* Laest. ap. Wahl. Fl. Suec., ed. 2, add. (1833) 1088. - *Molinia pendulina* Hartm. Handb., ed. 3 (1838) 24. - *Colpodium pendulinum* Griseb. in Ldb. Fl. Ross. IV (1853) 386. - *Graphephorum pendulinum* A. Gray, Transact. Bot. Soc. Canada (1861) 55. - *G. fulvum* A. Gray, l.c. - *Arctophila trichoclada* Rupr. Fl. samoied. cis. (1845) 62, tab. 4, fig. sinist. - *A. latiflora* Rupr., l.c., 62, tab. 4, fig. dextr. - *A. poecilantha* Rupr., l.c., 63, tab. 5, fig. dextr. - *A. remotiflora* Rupr., l.c., 63, tab. 5, fig. sinist. - *A. similis* Rupr., l.c., 63, tab. 6, fig. dextr. super. - *Poa* (*Arctophila*) *deflexa* Rupr., l.c., p. 62. - *Dupontia scleroclada* Rupr., l.c., tab. 6, fig. sinistra - *Colpodium Malmgrenii* Anders. in Öfvers. Vet. Ac. Stockh. XXIII (1866) 121, tab. II, fig. 1. - Exs.: HFR No 2701.

Perennial. Rhizomes numerous, long, creeping, with slender fibrous roots at the nodes; culms thick, (15) 40-100 cm tall; leaves flat, perfectly glabrous and smooth, green, (1) 3-6 (8) mm broad; ligules cut up into

* From Greek words *arctos* - bear, and metaphorically north, and *philos* - friend, i. e. friend of the north.

** Compiled by S. A. Nevskii.

narrow teeth at the tip. Panicle 10-15 (20) cm long, the branches in 3's-6's, more or less drooping at the ends; spikelets (4) 5-7 (9) mm long, more or less purple-tinged; lemmas thin-hyaline and golden-yellow at the summit, 3-3.5 mm long; glumes slightly unequal, 3-4 mm long. July-August. (Plate XXXIII, Figure 6, a-d).

Borders of lakes and rivers, often in water. -Arctic: Nov. Zem., Arct. Eur., Arct. Sib., Chuk., Anad.; East. Siberia: Len.-Kol.; Far East: Kamch. Gen. Distr.: Scand., Arct. Amer. Described from the coast of Eshkol'ts Bay. Type in Leningrad.

ECONOMIC IMPORTANCE. A valuable forage grass for deer. Readily eaten by other kinds of livestock as well. A valuable forage plant for geese and ducks.

Inflorescence an open or contracted panicle with slender, smooth branches. Spikelets 1-4 (-6)-flowered. Glumes hyaline, glabrous, somewhat unequal, shorter than the spikelet. Lemmas thin-hyaline and more or less serrate in upper part, 3-5-nerved, keelless, hairy on the nerves, more rarely glabrous, in lower part. There is a small naked callus at the base of each lemma. Palea 2-keeled, with rather long hairs on the keels in lower part. Lodicules 2, oval or oblong. Caryopsis elliptical, not furrowed. Perennials.

NOTE. Small grasses, with a limited distribution area, of no great importance as forage grasses. In the U.S.S.R. there are 14 species and, in addition, *C. Wrightii* Scribn. et Merr., described from Arakamchechen Island near Chukotskii Peninsula, is not definitely placed, and possibly belongs to another genus.

1. Culms bulbous at the base. Leaves usually setaceous-involute, short. Plants of clay steppes or stony slopes in the lower mountain zone, more rarely of dry high-mountain slopes 2.
- + Culms not bulbous at the base. Leaves mostly flat. High-mountain or arctic plants 4.
2. Spikelets very small, 2-flowered, more rarely 1-flowered, (1.75) 2-2.5 (3) mm long. Lemmas 2 mm long 14. *C. parviflorum* Boiss. et Bushe.
- + Spikelets larger, 3-5 (7) mm long, 2-5 (6)-flowered. Lemmas 2.5-3.5 mm long 3.
3. Lemmas densely pubescent on the nerves in lower part. Spikelets silvery, grayish- or brownish-purple in lower part, 3-4.5 (5) mm long, 2-4-flowered. A plant of clay steppes and of stony slopes in the lower mountain-zone 13. *C. humile* (M.B.) Griseb.
- + Lemmas very faintly puberulent on the nerves in lower part. Spikelets dark purple in lower part, 4.5-7 mm long, (2)3-5(6)-flowered. A plant of high-mountain stony slopes 12. *C. ornatum* Nevski.

* From Greek *colpodes* - bend.

** Compiled by S. A. Nevskii.

4. Spikelets 1-flowered 5.
 + Spikelets 2-3(4)-flowered 9.
 5. Spikelets golden-yellow. A tufted plant 8. *C. chrysanthum* G. Woron.
 435 + Spikelets greenish-purple, purple, or greenish-white. Plants usually
 with creeping rhizomes 6.
 6. Panicle with very slender, capillary branches, erect, short-pyramidal.
 A tufted plant, occasionally producing short creeping rhizomes
 9. *C. versicolor* (Stev.) Schmalh.
 + Panicle branches not very slender, not capillary, panicle lopsided
 with a nodding top. Plants with creeping rhizomes 7.
 7. Leaves glaucous-green. Panicle very narrow, sometimes almost
 spikelike, erect. Spikelets greenish-white, sometimes with a faint
 purplish shade 3. *C. leucolepis* Nevski.
 + Leaves green, flat, more rarely partly folded. Panicle looser. Spike-
 lets greenish-purple, with whitish-tipped bracts 8.
 8. Spikelets (3-3.5)-4-(4.2) mm long. Lemmas to 4 mm long
 2. *C. altaicum* Trin.
 + Spikelets 5-5.75 mm long. Lemmas to 5.75 mm long
 4. *C. colchicum* (Albov) G. Woron.
 9. Panicle small, oblong-oval or broadly lanceolate, rather dense,
 2-3(4) cm long. An arctic plant, occurring in stony tundras (Novaya
 Zemlya) 1. *C. Vahliaum* (Liebm.) Nevski.
 + Panicle larger, (3.5) 5-12 (17.5) cm long and usually much divided.
 High-mountain plants, occurring in alpine meadows and on stony
 screes in the alpine zone of the Caucasus 10.
 10. Rhizome creeping, with rhizomes. Spikelets 5-8 mm long 11.
 + Tufted plants, devoid of creeping rhizomes. Spikelets 3-5 mm long 13.
 11. Sheaths of old leaves reticulate-fibrillose. Panicle narrow, subspiculate,
 6-12 cm long, 0.8-1.5 (1.7) cm broad
 5. *C. araraticum* (Lipsky) G. Woron.
 + Sheaths entire or slightly divided into fibrous shreds (not reticulate).
 Panicle pyramidal, loose, 4-17.5 cm long and 2.5-10 cm broad 12.
 12. Spikelets reddish- or tawny-dark purple, more rarely greenish-
 purple. Leaves green. Panicle 4-10 cm long
 10. *C. ponticum* (Bal.) G. Woron.
 + Spikelets grayish-purple or glaucous-green. Leaves glaucous-green.
 Panicle 14-17.5 cm long 11. *C. lakium* G. Woron.
 13. Panicle broadly lanceolate or oblong-ovoid, dense, 3.5-5.5 cm long and
 0.7-1.7 cm broad, branches at most 2 cm long. Sheaths of old leaves
 copiously divided into flexuous fibers 6. *C. fibrosum* Trautv.
 436 + Panicle broadly oval, 3.5-8 cm long and 3-7.5 cm broad. Sheaths of
 old leaves entire or sparingly divided into separate fibers
 7. *C. variegatum* Boiss.

Series 1. Borealia Nevski. -Small tufted plants. Culms not thickened
 at base. Panicle oblong-oval, dense; spikelets 4-5 mm long, 2-3-flowered.
 1. *C. Vahliaum* (Liebm.) Nevski, comb. nova. -*Poa Vahliaum*
 Liebm. in Fl. Dan. fasc. XLI (1845) 4, tab. 2401. -*Glyceria Vahliaum*
 Fries in Ofver. Vet. Akad. Stockh. XXVI (1869) 140. -*Atropis Vahliaum*
 Richt. Pl. Europ. (1890) 92. -*Glyceria* (?) *Kjellmanni* Lange ex
 Kjellm. et Lundstr. in Nordensk. Vega-Exped. Vetensk. Jakt. I (1885)

314. -*Atropis Kjellmanni* Richt. Fl. Europ. (1890) 92. -*Puccinellia Kjellmanni* V. Krecz. in sched. Ic.: Fl. Dan. tab. 2401; Lange in Kjellm. et Lundstr., l.c., tab. 7.

Perennial. Rhizome short; culms 5-12 (15) cm tall, erect or geniculate at the base and enveloped by remains of old brownish sheaths; leaves flat or folded, up to 2 mm broad, green, smooth or naked; ligule subobtusely pointed, 1.5-2 mm long. Panicle oblong-oval or broadly lanceolate, dense, more rarely fairly loose, 2-3 (4) cm long and 0.4-1 (2) cm broad, the subappressed, smooth branches to 1.5 (2) cm long; spikelets dark purple or greenish-purple, with golden-whitish-tipped bracts, 2-3-flowered, 4-5 mm long; glumes oval or oblong-oval, scarcely shorter than the lower florets, the lower glume 1-nerved, 2.5-3 mm long, the upper 3-nerved, 3-3.5 mm long; lemmas oval-lanceolate, 3-4 mm long, 3-nerved, purple, whitish-golden-hyaline and more or less dentate-margined above, densely appressed-hairy in lower part. August-September.

Stony tundra. -Arctic: Nov. Zem. Gen. Distr.: Spitsbergen, Greenland. Described from Greenland (Niokornak). Type in Copenhagen, cotype in Leningrad.

Series 2. *Nutantia* Nevski. -Rhizomes creeping. Culms not thickened at the base. Panicle often nodding at the top, the 1-flowered spikelets (3.5) 4-5.75 mm long. Plants of stony screes in the alpine zone and of alpine meadows.

2. *C. altaicum* Trin. in Ldb. Fl. alt. 1 (1829) 100; Griseb. in Ldb. Fl. Ross. IV, 385; Kryl. Fl. Zap. Sib. II, 302. -Ic.: Ldb. Ic. pl. Fl. Ross. tab. 226.

437 Perennial. Rhizomes creeping; culms ascending at the base, 7-50 cm tall; leaves green, smooth and glabrous, flat or partly folded, 2-6 mm broad; ligules 2.5-4 mm long, obtuse or incised at the tip. Panicle with smooth branches, not dense, sometimes slightly nodding, 2-11 cm long and 0.7-3 cm broad (rarely up to 4-4.5 cm broad); length of individual branches 0.7-4 cm; spikelets 1-flowered, (3-3.5)-4-(4.2) mm long, greenish-purple or purple, with whitish-hyaline-tipped, more rarely greenish-white tipped, bracts; glumes oblong-ovate, acuminate, more or less scarious on the margin, unequal, the upper 3.5-4 mm long, the lower 2-2.8 mm long, glabrous; lemmas to 4 mm long, nearly as long as the glumes, whitish and more or less serrate at the summit, obscurely 3-nerved in lower part, with long white hairs on the nerves; anthers 2.4-2.6 mm long. June-July.

Alpine stony tundras. -West. Siberia: Alt.; East. Siberia: Ang.-Sayan.; Centr. Asia: Dzhung.-Tarb. Endemic. Described from Altai. Type in Leningrad.

3. *C. leucolepis* Nevski in Bull. Soc. Nat. Moscou (1934) -*C. altaicum* Trin. var. *humilior* Rupr. in Osten-Sacken et Rupr. Sert. Tiansch. (1869) 35.

Perennial. Rhizome creeping; culms ascending at the base, (5) 7-33 cm tall; leaves glaucous-green, folded, not more than 4.5 mm broad when unfolded, glabrous and smooth; ligules obtuse or incised at the tip, 3.5 mm long. Panicle very narrow, erect, with smooth, erect short branches; panicle 1.5-7 cm long and 0.5-1.5 cm broad (rarely up to 2.5 cm); length of individual branches 0.7-2 cm; spikelets 1-flowered, 4-5 mm long, greenish-white, occasionally with a faint purple shade; glumes oblong-ovate, acuminate, thin, whitish-green, glabrous, somewhat unequal, the lower

1-nerved, 2-3 mm long, the upper 3.5-5 mm long, 3-nerved, shorter than the spikelet; lemmas longer than the glumes, 4.5-5 mm long, thin-hyaline and serrate at the summit, the 3 faint nerves covered with long soft hairs in lower part; anthers blackish-purple, 2.8-3 mm long. June-July.

Stony screes and slopes in alpine zone. -Centr. Asia: Pam. -Al., Tyan'-Shan. Gen. Distr.: Kashgariya. Described from Pamir. Type in Leningrad.

4. *C. colchicum* (Albov) G. Woron. in Fomin and Voronov, Oprod. rast. Kavk. i Kryma (Determin. pl. of Cauc. and Crimea) I (1907) 125; Roshev. in Bull. Jard. Bot. Pier. Gr. XIV, Suppl. II (1915) 81. -*Catabrosa colchica* Albov, Prodr. Fl. Colch. (1895) 259. -*Catabrosa caucasica* Albov, l.c., 259. -*Colpodium causicum* G. Woron. l.c., p. 125. -*Catabrosa altaica* Boiss. Fl. Or. V (1884) 579. -Exs.: Kneucker, Gram. exs. No 258.

Perennial. Rhizome creeping; culms (10) 20-70 cm tall; leaves broadly linear, green, flat, short, those of the culm 2-5 cm long and 2-6 mm broad, smooth and glabrous; ligules subobtusate or pointed, more or less serrate at the tip, 3-7 mm long. Panicle nodding, rather loose, 3-10 cm long and to 438 4 cm broad; the slender, subcapillary, smooth branches to 4.5-5 cm long, arranged in 2's-3's; spikelets greenish-purple, with white-hyaline-tipped bracts, 1-flowered, 5-5.75 mm long; glumes lanceolate, pointed or subobtusate, entirely green or green with a purple-violet back, as long as the lemmas and paleas or nearly so, more rarely shorter and obtuse, somewhat unequal, the lower 3.5-4.5 mm long, the upper 4.2-5 mm long; lemmas up to 5.75 mm long, oblong or obovate, obtuse, more or less serrate at the summit, 3-nerved, with long, white, soft hairs on the nerves below; anthers 3 mm long. July-August. (Plate XXXIII, Figure 3, a-d).

Alpine meadows. -Caucasus: Ciscauc., West. Transcauc. Endemic. Described from Cherkesiya. Type in Geneva.

Series 3. *Reticulata* Nevski. -Rhizomes creeping. Culms not thickened at the base. Sheaths reticulate-fibrillose. Panicle narrow, spiciform, the 2-flowered spikelets 6-7 mm long. Plants of stony slopes in the alpine zone.

5. *C. araraticum* (Lipsky) G. Woron. in Fomin and Voronov, Oprod. rast. Kavk. i Kryma (Determin. pl. of Cauc. and Crimea) I (1907) 126. -*Catabrosa araratica* Lipsky in A. H. P. XIII, fasc. 2 (1894) 358.

Perennial. Rhizomes rather long, creeping; culms 30-60 cm tall, invested at the base in old, reticulate-fibrous sheaths; leaves narrowly linear, 1.5-3 mm broad, flat, green, glabrous and smooth; ligules subacute, to 5 mm long. Panicle contracted, narrow, subspiciform, erect, 6-12 cm long and 0.8-1.5 (1.7) cm broad, branches short, smooth; spikelets 2-flowered, 6-7 mm long, whitish-green, rather distinctly purple-shaded, with golden-tipped lemmas; glumes glabrous, lanceolate, shorter than the spikelet, acute or subacute, the lower 4-5 mm long, the upper 5-5.5 mm long, lemmas subacute, serrulate and golden-yellow at the summit, pilose on the nerves and internerves in lower half, 5-5.5 mm long, more or less purple-tinged; anthers to 4 mm long. July-August.

Caucasus: South. Transcauc. Endemic. Described from Mount Ararat. Type in Leningrad.

Series 4. *Variegata* Nevski. -Plants tufted, without creeping rhizomes. Culms not thickened at the base. Sheaths not reticulate-fibrillose, entire or disintegrating into nonflexuous shreds. Panicle short, the spikelets

3-5 mm long, 2-flowered, rarely 3-or 1-flowered. Plants of alpine meadows.

6. *C. fibrosum* Trautv. in A.H.P. II, fasc. 2 (1873) 486.

Perennial. Culms 13-22 cm tall, the dense basal sheaths copiously disintegrating into shreds; leaves green, flat, to 4 mm broad or folded, crowded at the culm base, cauline leaves few; ligules subobtusate, 2.5-3 mm long. Panicle broadly lanceolate or oblong-ovoid, dense, 3.5-5.5 cm long and 0.7-1.7 cm broad, branches very short (not exceeding 2 cm), appressed, smooth; spikelets 2-flowered, 3-5 mm long, purple with golden-brownish-tipped bracts; glumes ovate or lanceolate, purple, the lower 1-nerved, 2.5-3 mm long, the more pointed and narrower upper glume 3-nerved, 3-3.5 mm long; lemmas 3-3.5 mm long, oblong, subobtusate, in upper part with a golden-yellowish-brown, hyaline, serrate-margined fringe, in lower part 3-nerved and hairy on the nerves and internerves, more rarely only on the nerves. August.

Alpine meadows. -Caucasus: South. Transcauc. Gen. Distr.: Arm.-Kurd. Described from Mount Ararat. Type in Leningrad.

7. *C. variegatum* Boiss. Diagn. ser. I, V (1844) 72. -*Catabrosa variegata* Boiss. l.c., p. 71; Fl. Or. V (1884) 577. -*Poa catabrosoides* Koch in Linnaea, XXI (1848) 407. -*Catabrosa Balansae* Boiss. in Bal. Pl. exs. (1866) nomen; Bull. Soc. Bot. Fr. XXI (1874) 15. nomen; Fl. Orient. V (1884) 377. -*Colpodium Balansae* G. Woron., l.c. (1907); Hack. in Mitt. Kauk. Mus. VII (1913) 203. -*C. leianthum* Hack. l.c., p. 203 et in Fedde Repert. sp. nov. XIII (1913) 44 (forma *glumellis glabris*).

Perennial. Culms (12) 20-40 cm tall, more or less geniculate at the base, the dense, blackish-brown basal sheaths, undivided or weakly divided into separate fibers; leaves linear, to 5 mm broad, green, flat or folded, crowded at the culm base, cauline leaves 2-3 (4), short; ligules obtuse, ca. 3-4 mm long. Panicle short, broadly oval, 3.5-8 cm long and 3-7.5 cm broad, branches obliquely rising, smooth, more or less reflexed after flowering, in 2's-4's; spikelets 2-flowered, more rarely 3-flowered, two-colored, purple in lower half, golden in upper half, 3-5 mm long. Glumes lanceolate, purple, unequal, the lower 1-nerved, more pointed, 2.5-3 mm long, the upper 3-nerved, 3.5-4 mm long; lemmas oblong, 3-4 mm long, purple in lower half, golden-hyaline in upper half, bluntly serrate on the margin, 3-nerved in lower part, with short silky hairs on the nerves and sometimes between the nerves, more rarely (in *f. leianthum* (Hack.) Nevski) entirely glabrous. July-August.

Alpine meadows. -Caucasus: Ciscauc., Dag., West. Transcauc., East. Transcauc. (western part of the region). Gen. Distr.: Balk.-As. Min. Described from Vifinian Olympus. Type in Geneva, cotype in Leningrad.

8. *C. chrysanthum* G. Woron. in Acta Inst. Acad. Sc. USSR, ser. I, 1 (1933) 213.

Perennial. Culms 20-27 cm tall, the old basal sheaths dense, blackish-brown; leaves flat, green, glabrous and smooth, to 3 mm broad, the upper cauline leaves very short, 4-11 mm in length; ligules obtusish, 2.5 mm long. Panicle 5-6 cm long and 1.5-4 cm broad, oblong-oval, the slender, smooth branches in 2's-3's; spikelets 1-flowered, 3-5-4 mm long, golden-colored; glumes ovate, the lower 1-nerved, 1.8 mm long, the upper 3-nerved, 2.25 mm long, shorter by half or nearly half than the lemmas.

greenish-lemon-colored; lemmas 3-3.25 mm long, obtuse, golden, thin-hyaline, densely covered with short hairs in lower part, dentate-margined above. July.

Alpine meadows. -Caucasus: West. Transcauc. Endemic. Described from Svanetiya (Gul'skii Glacier). Type in Leningrad.

Series 5. *Versicolora* Nevski. -Tufted plants, sometimes producing creeping rhizomes. Culms not thickened at the base. Panicle loose, with very slender, capillary branches, the 1-flowered spikelets 2.5-4 mm long. Plants of alpine meadows. *C. violaceum* (Boiss.) from Persia, belonging to this series, differs in glabrous bracts.

9. *C. versicolor* (Stev.) Schmalh. in Fl. Ross. med. et austr. II (1897) 638. -*Agrostis versicolor* Stev. in Mem. Soc. Nat. Mosc. III (1812) 252. -*Colpodium Steveni* Trin. Fund. (1820) 119; Griseb. in Ldb. Fl. Ross. IV, 384. -*Catabrosa versicolor* Boiss. Fl. Or. V (1884) 579. -*Colpodium Schelkownikowii* Grossh. Fl. cauc. I (1928) 277; Journ. Soc. Bot. Russ. XIV (1929) 297. -*lc.*: Trin., l.c., tab. VII.

Perennial. Culms glabrous and smooth, slender, 9-25 (40) cm tall, sometimes geniculate at the base; leaves narrowly linear or setaceous, green, smooth, to 2.5 (3) mm broad; ligules pointed, 1.5-3 mm long. Panicle short-pyramidal, 2-10 cm long and 1.5-9 cm broad, the very slender, capillary, smooth, drooping branches arranged in 2's-4's and bearing few spikelets at their ends; spikelets 1-flowered, green, greenish-purple or purple, with white-tipped bracts, 2.5-4 mm long; glumes oblong-lanceolate, subobtusate, rather prominently nerved, the lower 2-3.5 mm long, 1-nerved, the upper 2.5-4 mm long, 3-nerved, nearly as long or as long [as lemma and palea?], more or less purple, scarious-margined; lemmas oblong, 2.5-4 mm long, scarious and slightly dentate at the summit, obscurely 3-nerved in lower half, the nerves and internerves covered with short hairs. (June) July-August. (Plate XXXIII, Figure 1, a-d).

Alpine meadows. -Caucasus: Ciscauc., Dag., West., East. and South. Transcauc. Endemic. Described from the alpine zone of Shakh-dag and Tufan-dag Mountains. Type in Helsinki, cotype in Leningrad.

Series 6. *Pontica* Nevski. -Rhizome creeping. Culms not thickened at the base. Panicle loose, with capillary branches; spikelets 2-4-flowered, 5-8 mm long. Lemmas with a tuft of long, cobwebby hairs at the base. Plants of alpine meadows. Species intermediate between the genera *Colpodium* and *Poa*.

441 10. *C. ponticum* (Bal.) G. Woron. in Fomin and Voronov, Opre-d. rast. Kavk. i Kryma (Determin. pl. of Cauc. and Crimea) I (1907) 126; Roshev. in Bull. Jard. Bot. Pier. Gr. XIV, Suppl. II (1915) 81. -*Catabrosa pontica* Bal. Bull. Soc. Bot. Fran. XXI (1874) 15. -*Poa capillipes* Som. et Lev. in A.H.P. XII (1893) 52. -*lc.*: Som. et Lev. in A.H.P. XVI (1900) tab. XLV.

Perennial. Tufted; rhizome short-creeping; culms (15) 20-40 cm tall; leaves thin, green, smooth, flat or folded, to 3 (4) mm broad; ligules short. Panicle short-pyramidal, 4-10 cm long and 2.5-6 cm broad, loose, the slender, capillary, smooth branches arranged in 2's (-3's) and bearing 1-3 spikelets at the ends; spikelets reddish- or tawny-dark-purple, with scarious-tipped bracts, (2) 3-4-flowered, 5-8 mm long; glumes oblong-lanceolate, subobtusate as long as the lower florets, the lower glume 1-nerved, 4-4.2 mm long, the upper 3-nerved, 4.5-5 mm long; lemmas

dark purple, with a thin semitransparent denticulate summit, 4.5-5 mm long, 3-nerved, hairy on the nerves below, a web of long, very slender, white hairs. July-August.

Alpine meadows and snows. -Caucasus: Ciscauc., West. Transcauc. Gen. Distr.: Lazistan. Described from Turkey (Dzhimil'). Type in Geneva.

11. *C. lakium* G. Woron. in Act. Inst. Bot. Acad. Sci. URSS, ser. I, 1(1933) 214.

Perennial. Rhizome creeping; culms geniculate at the base, 50-55 cm tall; leaves narrowly linear, folded, glaucous-green, glabrous; ligules subacute and more or less notched at the tip, to 5 mm long. Panicle very loose, nodding at the top, 14-17.5 cm long and 9-10 cm broad, the slender, smooth, flexuous branches up to 8 cm long, in 2's; spikelets 2-4-flowered, grayish-purple or glaucous-greenish with a rather pronounced purple hue, 5-8 mm long; glumes subacute, somewhat shorter than the lower florets, the lower glume 4 mm long, the upper 5 mm long; lemmas 4.5-5 mm long, greenish-purple or purple in lower part, scarious with a golden shade toward the summit, crenate at the tip, 3-nerved, hairy on the nerves in the lower 2/3, with slender, flexuous, white hairs at the base. August-September.

Mountain meadows. -Caucasus: Dag. Endemic. Described from Nukkura-chai River (Lakskii Okrug). Type in Leningrad.

Series 7. *Humilia* Nevski. -Tufted plants, bulbous at the base. Panicle pyramidal, loose; spikelets (1) 2-5-flowered, 2-5 (7) mm long. Plants of clay steppes and stony slopes of the lower mountain zone, more rarely of high-mountain stony slopes.

12. *C. ornatum* Nevski sp. nova in Addenda p. 757.

Perennial. Densely tufted; culms bulbous at the base and invested in grayish-brown old sheaths which disintegrate slightly into shreds; leaves narrowly linear, short, smooth. Panicle pyramidal, (2) 3.5-6.5 cm long and (2) 3.5-6 cm broad, the smooth branches in (2's) 3's-4's, each bearing (1-2) 3-5 spikelets; spikelets (2) 3-5 (6)-flowered, 4.5-7 mm long, 442 2-flowered, the bracts dark purple in lower part and thin-scarious, golden-shaded in upper part; glumes very small, ovate, subequal, 2 mm long, subobtus; lemmas obtuse, more or less toothed at the summit, faintly short-pubescent on the 5 obscure nerves, 3-3.5 mm long; anthers purple-colored. June-July.

High-mountain stony slopes. -Centr. Asia: Pam. -Al. Endemic. Described from Kugitang Range. Type in Leningrad.

13. *C. humile* (M. B.) Griseb. in Ldb. Fl. Ross. IV (1853) 384. -*Aira humilis* M. B. Fl. taur.-cauc. I (1808) 57. -*Catabrosa humilis* Trin. Fund. Agrost. (1820) 136. -*Colpodium bulbosum* Trin. Mém. Acad. Pétersb., ser. 6, I (1831) 394.

Perennial. Forming dense tufts; culms 5-20 (15) cm tall, bulbous and invested in old sheaths at the base; leaves narrowly linear, short, glabrous, scaberulous on the margin; ligules oblong, 2 mm long; sheaths of lower leaves more or less purple-tinged. Panicle pyramidal, (2.5) 3.5-7.5 cm long and 2-7 cm broad, loose, the slender, smooth branches in 2's-5's; spikelets 2-4-flowered, 3-4.5 (5) mm long, silvery, brownish-purple or greenish-purple in lower part; glumes very small, the lower 1.5-2 mm long, the upper 2-2.25 mm long, acute or subacute, ovate; lemmas 2.5-3 mm long, scarious in upper part, erose at the summit, the

5 nerves in lower part densely covered with slender white hairs. April-May. (Plate XXXIII, Figure 2, a-d).

Clay steppes, stony slopes. -European part: Low. Volg., Zavolzh., Low. Don.; Caucasus: Ciscauc., Dag., East. and South. Transcauc., Tal.; West. Siberia: Irt., Upp. Tob.; Centr. Asia: Ciscauc., Syr-Dar., Aral. -Casp. Gen. Distr.: Dzung. -Kashg., Arm. -Kurd. Described from the Caucasus (Mount Beshtau). Type in Leningrad.

445. 14. *C. parviflorum* Boiss. et Buhse Diagn. sér 2, VI (1859) 133. - *Catabrosa parviflora* Boiss. Fl. Or. V (1884) 578. - *Colpodium Woronowii* Hack. Monit. Jard. Bot. Tiflis XXXII (1914) 8.

Perennial. Tufted; culms thickened at the base; erect or somewhat geniculate below, 15-40 (50) cm tall; leaves glabrous, narrowly linear, 1-2 mm broad; ligules 1-3 (4) mm long, acuminate. Panicle broadly oval, 6-11 cm long and 3.5-9 cm broad, loose, with spreading, smooth, capillary branches, arranged in 3's-5's (6's); spikelets 2-flowered, rarely 1-flowered, very small (1-75) 2-2.5 (3) mm long, greenish-purple, their bracts whitish or whitish with golden-tawny-tinged tips; glumes ovate, obtuse, the lower 1.2-1.5 mm, the upper 2.5-1.8 mm long; lemmas ovate, obtuse, faintly serrulate at the summit, 2 mm long, with 5 slender nerves, entirely glabrous or minutely appressed-puberulent on the nerves below. (April) May-June. (Plate XXXIII, Figure 4, a-e).

Grassy and stony slopes of the middle mountain zone. -Caucasus: South. Transcauc.; Centr. Asia: Upp. Turkm. Gen. Distr.: Arm. -Kurd., Iran. Described from North. Persia (Sakhend Mountain). Type in Geneva, co-type in Leningrad.

173. CATABROSA* P. B.**

P. B. Agron. (1812) 97.

Inflorescence a panicle with smooth, spreading or appressed branches. Spikelets 2-flowered, rarely 3-flowered or 1-flowered, but in the latter case there is always a rudimentary stipe of the second floret. Glumes unequal and much shorter than the spikelet, glabrous, faintly nerved only at the base, more or less toothed at the summit. Lemmas convex on the back, prominently 3-nerved, narrowly scarious at the summit. Lodicules small, ovate, obtuse. Stamens 3, with anthers ca. 1.5 mm long. Caryopsis oblong-ovate; hilum minute. Perennials with creeping rhizome.

1. Panicle loose, open, 10-20 (25) cm long and 3-7 cm broad, with divergent branches. Lemmas greenish-yellow or yellowish-brown. 1. *C. aquatica* (L.) P. B.
- + Panicle narrow, almost spikelike, (2.5) 5-15 cm long and 0.5-1.5 . . . (2) cm broad, with appressed branches. Lemmas blackish-brown 2. *C. Capusii* Franchet.

* From Greek *katabrosis* - gnawing out, referring to erose apex of glumes.

** Compiled by S. A. Nevskii.

1. *C. aquatica* (L.) P. B. Agrost. (1812) 97, tab. 19, fig. 8; Griseb. in Ldb. Fl. Ross. IV, 387; Shmal'g. Fl. II, 632. — *Aira aquatica* L. Sp. pl. (1753) 64. — *Glyceria aquatica* Presl, Fl. Cech. (1819) 25. — *Colpodium aquaticum* Trin. Mém. Ac. Pétersb. sér. 6, I (1830) 395. — *Poa airoides* J. Ch. G. Hermann in Mém. Soc. Imp. Nat. Mosc. III (1812) 232. — *P. pseudoairoides* Hermann l. c., tab. XIII. — 446 Ic.: P. B., l. c.; Syreishch., III. Fl. Mosk. gub. (III. To Fl. of Moscow Guberniya) I (1906). — Exs.: HFR No 797.

Perennial. Culms ascending or geniculate at the base and rooting at the lower nodes, 20–60 cm tall; leaves flat, green, glabrous and smooth, to 7 mm broad; ligules 3–4 mm long, obtuse-rounded at the tip. Panicle loose, open, 10–20 (25) cm long and 3–7 cm broad, with smooth, divergent branches arranged in 4's–8's; spikelets 2-flowered, very rarely 3- or 1-flowered, 2.5–3 (3.5) mm long; glumes obscurely nerved only at the base, the lower 1-nerved, 1 mm long, the upper 3-nerved, 1.5–2 mm long, much shorter than the spikelet, green or greenish-purple; lemmas ca. 2.5 mm long, greenish-yellow or yellowish-brown, somewhat scarious at the summit and faintly tridentate, glabrous, dull, with 3 thick, prominent nerves; anthers ca. 1.5 mm long, June–July.

Wet meadows. — European part: all regions; Caucasus: all regions; West Siberia: Upp. Tob., Alt.; East Siberia: Ang. — Sayan., Daur.; Centr. Asia: Aral. — Casp., Pam. — Al., Syr-Dar., Tyan'-Shan, Dzung. — Tarb. Gen. Distr.: Europe, Medit., Balk. — As. Min., Arm. — Kurd., Ind. — Him., Tib., Mong., N. Am. Described from Europe. Type in London.

2. *C. Capusii* Franchet in Ann. Sc. Nat. sér. 6 XVIII (1884) 272.

Perennial. Culms 10–35 (67) cm tall, geniculate at the base; leaves green, flat, entirely glabrous and smooth, to 6 mm broad; ligules 3–6 mm long, oblong, or ovate, broad, rounded-obtuse.

Explanation to Plate XXXIII

1. *Colpodium verticillatum* (Stev.) Schmalh., spikelet, a) and b) glumes, c) palea, d) lemma. —
2. *C. humile* (M. B.) Griseb., spikelet, a) and b) glumes, c) palea, d) lemma. — 3. *C. colchicum* (Albov) G. Wor., spikelet, a) and b) glumes, c) palea, d) lemma. — 4. *C. parviflorum* Boiss. et Buhse, panicle, a) and b) glumes, c) palea, d) lemma, e) spikelet. — 5. *Duportia Fischeri* R. Br., spikelet, a) and b) glumes, c) palea, d) lemma. — 6. *Arctophila fulva* (Trin.) Andert., spikelet, a) and b) glumes, c) palea, d) lemma. — 7. *Catabrosa Capusii* Franch., panicle, a) and b) glumes, c) palea, d) lemma, e) spikelet. — 8. *Phippisia algida* (Soland.) R. Br. — 9. *Ph. concinna* (Th. Fries) Lindb., a) and b) spikelet, c) lemma, d) palea (according to Th. Fries).



Panicle narrow, subspiciform, (2.5) 5-15 cm broad, 0.5-1.5 (2) cm long [measurements obviously reversed], more or less interrupted below, the upper branches very short, the lower longer, but erect and appressed; spikelets 2-flowered, 3.5-4 mm long; glumes very small, glaucous-pale-green, unequal, the lower 1-1.2 mm long, the upper 1.2-1.5 (2) mm long, obscurely nerved, more or less toothed at the summit; lemmas blackish-brown, somewhat scarious at the summit and toothed, glabrous, 2.5-2.75 mm long, prominently 3-nerved; anthers light yellow, 1.5 mm long. July-August. (Plate XXXIII, Figure 7, a-e).

Wet meadows-. Centr. Asia: Pam.-Al. Endemic. Described from Iskander-Dar'ya valley. Type in Paris.

Genus 174. PHIPPSIA* R. Br.**

R. Br. Chlor. Melvill. (1824) 285.

Inflorescence a small, contracted or open panicle with very slender, smooth branches. Spikelets 1-flowered (panicles rarely contain 2-flowered ed spikelets), small, ca. 1-1.5 mm long; glumes minute, obsolete, sometimes lacking. Lemmas glabrous or pubescent on the nerves, serrulate at the summit. Stamens 2-2 (3). Anthers 0.4-0.5 mm long. Caryopsis flattish, with a narrow, oval-oblong hilum. Dwarf arctic perennial grasses, forming dense tufts.

1. Panicle to 3 cm long, contracted. Lemmas glabrous or scantily pubescent. The ripe caryopsis broadest above the middle, not longer than the lemma 1. *Ph. alida* (Soland.) R. Br.

+ Panicle longer, 3-8 cm long, spreading, rarely somewhat contracted. Lemmas copiously covered below with white hairs. The ripe caryopsis narrow, broadest below the middle, as long as the lemma or longer 2. *Ph. concinna* (Th. Fries) Lindeb.

1. *Ph. alida* (Soland.) R. Br. Chlor. Melvill. (1824) 285. - *Agrostis alida* Soland. Phipps' Voy. (1774) 200. - *Catabrosa alida* Fries, Nov. Fl. Seuc. Mant. III (1842) 173; Griseb. in Ldb. Fl. Ross. IV, 388, pro parte. - Ic.: Fl. Dan. tab. 1505. - Exs.: Kneuck. Gram. exs. No 583.

Perennial. A dwarf plant, usually not exceeding 2-7 cm in height, with glabrous and smooth, flat leaves. Panicle 0.7-2 (3) cm long, contracted; spikelets small, 1-flowered (very rarely 2-flowered spikelets occur), ca. 1 mm long, greenish-yellow or greenish-purple; glumes usually 2; lemma and palea glabrous or scantily pubescent; stamens mostly 2; anthers 0.4 mm long and nearly as broad, obovate. July-August. (Plate XXXIII, Figure 8).

* Named for the English polar explorer K. [should be C. J.] Phipps, 1744-1792.

** Compiled by S. A. Nevskii.

Borders of streams and wet places in the arctic region, in boggy tundras. - Arctic: Nov. Zem., Arct. Eur., Arct. Siberia, Anad. Gen. Distr.: Scand., Arctic islands, Arctic N. Am. Described from Spitsbergen.

2. *Ph. concinna* (Th. Fries) Lindeb. Bot. Not. (1898) 155. - *Catabrosa concinna* Th. Fries, Ofvers. Vet. Acad. XXVI (1869) 140. - *Ph. algida* var. *concinna* Richt. Pl. Eur. I (1890) 40; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 198. - Ic.: Th. Fries., l. c. V.

Perennial. Densely tufted; culms to 15-17 (25) cm tall; leaves green, glabrous and smooth, narrowly linear. Panicle diffuse, 3-8 cm long, with spreading branches, rarely narrow and dense (f. *aligidiformis* Holmb.); spikelets 1-flowered (rarely 2-flowered), ca. 1.5 mm long, greenish-whitish-brown or greenish; glumes minute, usually only one glume being present, often both glumes lacking; lemmas copiously covered with white hairs on the nerves below; palea densely ciliate on the keels; stamen mostly 1; anthers 0.5 mm long, oblong. August. (Plate XXXIII, Figure 9, a-d).

448 Borders of streams and wet places in tundras. - Arctic: Nov. Zem., Arct. Siberia. Gen. Distr.: Scand., Arctic islands. Described from Spitsbergen. Type in Stockholm, cotype in Leningrad.

Ph. algida × *Ph. concinna* (Holmb. Bot. Not. (1924) 132). A sterile hybrid with panicle narrower than in *Ph. concinna* and faintly pubescent lemma and palea. Anthers remain closed throughout and contain about 5% of developed pollen. Occurring infrequently together with both species.

Genus 175. *SCOLOCHLOA** LINK**

Link, Hort. Berol. I (1827) 136.

Spikelets 3-4-flowered, disposed in a large, open panicle. Glumes acute, with membranaceous margins, 3-5-nerved, with a scaberulous keel on the back; lemmas convex on the back, 5-7-nerved, toothed at the summit, with 2 basal tufts of hairs at the base, ca. 1 mm long; lodicules with a lateral lobe or dentate; caryopsis oblong, grooved on the inside, villous at the top.

1. *S. festucacea* Link, Hort. Berol. I (1827) 137; Griseb. in Ldb. Fl. Ross. IV, 393; Shmal'g. Fl. II, 624; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 304. - *Grapphephorum arundinaceum* Aschers. Fl. Brand. I (1864) 852. - *Festuca borealis* Mert. et Koch. Deutsch. Fl. I (1823) 664. - *Fluminia arundinacea* Fries, Summa veget. I (1839) 247. - *Arundo festucacea* Willd. Enum. I (1869) 126.

Perennial. Rhizomes creeping, to 4 mm thick; culms erect, to 2 m tall, rooting at the lower nodes; leaves flat, smooth, to 40 cm long and 10 mm [should obviously be mm] broad, with sharply scabrous margins. Panicle [should obviously be mm] broad, with sharply scabrous margins. Panicle with appressed branches, silvery-white, ultimately open and dark, 15-30 cm long, with scaberulous, 3-angled branches in fascicles of 2-3; spikelets

* From Greek words *scolos* - point and *chlos* - green.

** Compiled by V. L. Komarov.

somewhat laterally compressed, oblong or sublancoolate, 7-10 mm long; with an inconspicuous short awn. June-July.

Borders of water bodies, often forming large thickets in lakes. -Europe-an part: Kar. -Lap., Dv. -Pech., Lad. -Il'm., Upp. Volg., Volg. -Kam., Upp. Dnep., Mid. Dnep., Volg. -Don., Zavolzh., Prichern., Low. Don., Low. Volg.; Caucasus: East. Transcauc. (Tiflis, Akhalkolaki); West. Siberia: Upp. Tob., Ob. region, Irt.; East. Siberia: Len. -Kol., Ang. -Sayan., Daur. Gen. Distr.: Scand., Centr. Eur., North. Mongolia.

Genus 176. GLYCERIA* R. BR.**

R. Br. Prodr. fl. Nov. Holl. 1 (1810) 179. -Panicularia Fabr. Enum. pl. Horti Helmet. ed. 2 (1763) 373.

The name *Glyceria* is retained and *Panicularia* rejected, in conformity with par. XX of International Rules of Botanical Nomenclature of 1905.

Panicle contracted or open, with 3-angled axis and scaberulous branches; spikelets many-flowered, oblong or cylindrical, of medium size or rather large; glumes rounded on the back, with 5-9, mostly 7, prominent, scabrous nerves, obtuse, with a thin white fringe at the tip; stigmas plumose; caryopsis oval or oblong, furrowed on the inside. Leaves with sheath closed all the way up and blade folded when young. Perennials.

NOTE. The first species described - *Poa aquatica* L.; first species referred to the genus *Glyceria* - *G. fluitans* R. Br. (40 species, including one on Australia, others in Europe, Asia, and North America, some extending into Africa). Partly fodder grasses.

1. Spikelets large, terete up to flowering, lemma and palea united; culms ascending (Section I. *Euglyceria* Griseb.) 2.
- + Spikelets of medium size or small, laterally compressed; lemmas and paleas separate; culms erect (Section II. *Hydropoa* Dumort.) 6.
2. Lower panicle branches with a branchlet at the base much shorter than the other branchlets and bearing a single spikelet; anthers dark 3.
- + Lower panicle branches with a branchlet at base bearing 2-4 or more spikelets; anthers yellow 4.
3. Panicle very loose, the branches very slender, pendent, paired; internodes between panicle branches ca. 2 cm 3. *G. turcomanica* Kom.
- + Panicle with more closely set, erect branches 5.
4. Leaves from 3 mm to 1 cm broad, scabrous on the lower side; ligules to 5 mm long, obtuse, often lacerate; panicle 6-60 cm long; spikelets 7-11-flowered 1. *G. fluitans* R. Br.

* From Greek *glykeros* - sweet, alluding to the agreeable taste of the seeds.

** Compiled by V. L. Komsarov.

- + Leaves to 3 mm broad, mostly 1 mm, smooth; ligules acute or bifid; panicle 6-12 cm long; spikelets 5-8-flowered 4. *G. leptorhiza* (Maxim.) Kom.
- 5. Ligules only slightly bifid; panicle broader than in *G. fluitans*, not interrupted, often nodding; panicle branches pointing in various directions; spikelets 7-11-flowered; glumes 7-nerved 2. *G. plicata* Fries.
- + Ligules strongly cleft, often with hairlike divisions; panicle very loose; spikelets mostly 7-flowered; glumes with 3 prominent and 4 faint nerves 5. *G. nemoralis* Uechtritz et Korn.
- 6. Culms very slender; rhizome obsolete; leaves ca. 2 mm broad; spikelets small and narrow 6. *G. natans* Kom.
- + Rhizome distinctly developed; leaves upwards of 5 mm broad; spikelets elongate 7.
- 7. Forest plants; culms tall, slender, erect; panicle with slender, more or less drooping branches 8.
- + Plants of open places, often semiaquatic; panicle not drooping ... 9.
- 8. Ligule very short, round; lower panicle branches 2-5 in number; spikelets 3-8-flowered, few 8. *G. caspica* Trin.
- + Ligule 2-3 mm long, thin, lacerate; panicle branches slender, subcapillary; lowest node with 5-7 branches; spikelets 3-5-flowered 7. *G. lithuanica* (Gorski) Lindm.
- 9. Spikelets 3-4-flowered; glumes subequal; lemma subacute, bifid at the summit, with rather indistinct nerves; forming stolons which spread over the water; leaves abundant, the upper ones often reduced in length 11. *G. spiculosa* (Fr. Schmidt) Roshev.
- + Spikelets 3-8-flowered 10.
- 10. The entire plant dark green; panicle erect, with long horizontal branches, loose, to 20 cm long 10. *G. alnasteretum* Kom.
- + Light green or yellowish-green plants; panicle branches erect and rather approximate 11.
- 11. Panicle of medium size, the branches very scabrous; spikelet 3-6-flowered, with lanceolate bracts 9. *G. Orientalis* Kom.
- + Panicle large; the entire plant to 2 m tall; spikelets oblong, 3-6-, or 5-8-flowered, with oblong bracts 12.
- 12. Panicle often 1-sided or nodding, usually entirely light green, its lower branches in threes; spikelets very abundant 16. *G. ussuriensis* Kom.
- + Panicle erect, compact or open 13.
- 13. Leaves 5-12 mm broad, very scabrous underneath; culms 0.5-1.5 m tall; panicle open; spikelets 3-5-flowered, ca. 5 mm long 13. *G. arundinacea* (M. B.) Kunth.
- + Leaves 10-20 mm broad, smooth; culms 0.5-2 m tall, firmer ... 14.
- 14. Panicle 20-40 cm long, contracted, with relatively short, erect branches; spikelets 5-8-flowered 12. *G. aquatica* (L.) Wahlb.
- + Panicle very open, often with horizontally spreading branches and slightly nodding; spikelets 3-6-flowered, rarely 7-flowered ... 15.
- 451 15. Panicle branches relatively firm; lemmas and paleas rather strongly developed, crenulate at the summit 14. *G. triflora* (Korsh.) Kom.

- + Panicle branches subcapillary; lemmas and paleas thin, longer and more attenuate toward the apex than in the preceding species
 15. *G. kamschatkica* Kom.

Series 1. *Fluitantes* Anderss. Gram. Scand. (1852) 51. — Manna-grasses with large terete spikelets, united lodicules and flattened leaf sheaths.

1. *G. fluitans* (L.) R. Br. Prodr. I (1810) 179; Griseb. in Ldb. Fl. Ross. IV, 390; Shmal'g. Fl. II, 638; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) I, 306; Grossg. Fl. Kavk. (Fl. Cauc.) I, 113. — *Festuca fluitans* L. Sp. pl. (1753) 75. — Exs.: HFR No 1396 and 1397; Doerfler, Herb. Normale No 4984. — Ic.: Rchb. Ic. Fl. Germ. I, tab. II, fig. 1615.

Perennial. Rhizomes creeping; culms geniculate-ascending, to 1 m tall and 1-4 mm thick, more rarely 10-15 cm tall (var. *pumila* Wimm. et Gr.); leaves scaberulous on the margin and on the underside, fairly thick, 6-13 cm long and 2-7 mm broad (9 mm on the thickened culm in var. *latifolia* Beck.); leaf sheaths almost entirely covering the nodes; ligules 5-7 mm long, cleft at the end. Panicle narrow, 10-35 cm long; panicle branches secund, appressed to main axis before and after anthesis, more rarely inflorescence subracemiform (var. *loliacea* Asch. u. Gr.); spikelets appressed, linear-cylindrical, 7-11-flowered, 10-20 mm long and at most to 3 mm broad; glumes white, membranaceous, ovate, acute; lemmas 4-6 mm long, oval-linear or oblong-ovate, short-acuminate, prominently 7-nerved; anthers purple; caryopsis brown, 3 mm long and 0.75 mm broad. May-June and later. (Plate XXXIV, Figure 1).

Flood meadows, borders of ponds and lakes, streams and peat trenches, canals, ect., often in considerable quantity. — European part: Kar. — Lap., Dv. — Pech., Lad. — Il'm., Upp. Volg., Volg. — Kam., Upp. Dnep. Mid. Dnep., Volg. — Don, Prichern. (west.), Crimea (west.); Caucasus: Cis-cauc., West. Transcauc. and West. part of East. Transcauc.; West. Siberia: Ob. region (rare). Gen. Distr.: Eur. exc. Arct., Balk. — As. Min. (rare), N. Am. and Australia. Described from Centr. Eur. Type in London.

NOTE. The typical form here described is sometimes called var. *festucacea* Fries Nov. Nant. II (1839) 7.

ECONOMIC IMPORTANCE. A forage grass of medium quality, suitable when young — for damp, slightly boggy or flooded soils. Provides good silage. The seeds under the name "manna", "Schwaden" in Poznan', "Manna-grutze, Mannahirse, or Himmelthau" in Germany, are gathered in some places in Sweden, Poland, east Germany, Hungary, as well as in the north-western part of the U.S.S.R., and are made into meal after removal of the brown hulls. Serves as good poultry feed.

- 452 2. *G. plicata* Fries, Mantissa III (1842) 176; Shmal'g. Fl. II, 638; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 307; Griseb. Fl. Kavk. (Fl. Cauc.), 113.; *G. fluitans* var. *plicata* Fries, Nova Mant. II (1839) 6; Griseb. in Ldb. Fl. Ross. IV, 391.

Perennial. Resembling the preceding species, but culms shorter, and flattened together with the leaf sheaths which cover the internodes; panicle more open, the more numerous branches pointing in different directions, the lower ones arranged in 3's-5's, shorter, each bearing several spikelets (in *G. fluitans* the lowest branch of the inflorescence short and

bearing only a single spikelet); lemmas obtusely rounded; anthers yellow. May-June, and later. (Plate XXXIV, Figure 2).

Borders of ponds containing relatively hard water, and flood meadows. Less frequent than the preceding species. - European part: Lad. - Il'm., Upp. Volg., Upp. Dnep., Volg. - Kam., Mid. Dnep., Prichern., Volg. - Don., Low. Don., Zavolzh.; Caucasus: Ciscauc., West., South., and East. Transcauc.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Pribalkh., Dzung. - Tarb., Tyan' - Shan, Syr - Dar., Pam. - Al., Upp. Turkm. Gen. Distr.: Centr. and Atl. Eur., Balk. - As. Min., Dzung. - Kashg. Described from South. Scandinavia. Type in Stockholm.

ECONOMIC IMPORTANCE. Like the preceding species.

3. *G. turcomanica* Kom. sp. nova Addenda p. 757. - *G. fluitans* Roshev. in Fedtsch. Fl. Turcom. 148 (ex p.).

Perennial. Rhizome creeping; culms ascending at the base, then erect, to 1 m tall, 3 mm in diameter, uniformly leafy; the sterile shoots at the base short; leaves flat, thin, 5-8 mm broad, dark green, smooth underneath; scaberulous on the upper surface, gradually tapering toward the apex; ligules elongate, 5-8 mm long, very thin, readily lacerate. Panicle ca. 30 cm long, very loose, branches subcapillary, the lower ones arranged in threes, the middle ones in twos, spreading evenly in all directions, the uppermost solitary, all strongly reflexed, almost adherent to the culm in maturity, smooth, the longest branches bearing 5 spikelets, most 1-3 spikelets; all spikelets long-pedicel, 4-8-flowered, ca. 15 mm long and 2.5-3 mm broad, terete; lemmas pale green, with a narrow, silvery fringe at the rounded tips, prominently 5-7-nerved on the back. May-June.

In shade, near water. - Centr. Asia: Upp. Turkm. Endemic. Described from Ai-dere and Mustafa-dere gorges, near Nukhur. Type in Leningrad.

NOTE. Differs from the European *G. fluitans* R. Br. in lemmas rounded at the tip, small spikelets, and shape of inflorescence. From *G. plicata* Fries it differs in the strongly spreading, small spikelets. Distinguished from *G. nemoralis* Uechtritz u. Korn. by the nerves of lemmas being of equal length.

4. *G. leptorhiza* (Maxim.) Kom. Fl. Mansh. in A. H. P. XX (1901) 307; Kom. and Al. Opred. (Determin.) I, 222. - *G. fluitans* R. Br. Var. ? *leptorhiza* Maxim. Prim. Fl. Amur. (1859) 320.

453 Perennial. Rhizome slender, creeping and branching; culms 20-40 cm tall, ascending, very slender, with 2 or 3 flat, linear leaves, 2.5 mm broad, smooth, acute. Panicle narrow, linear, suberect, 8-12 cm long; panicle branches smooth, approximate, in 1's-3's, each bearing 1-4 spikelets on very short pedicels; spikelets linear, slightly flattened, 5-6-flowered, rarely 8-flowered, ca. 3 mm broad, 8-12 mm long; lemmas smooth, 7-nerved, subobtus, with a membranaceous fringe; palea emarginate, with 2 scabrous nerves; anthers reddish-purple. July. (Plate XXXIV, Figures 4, 5).

River banks, on clay soil, sometimes among osier-beds. - Far East: along Amur River, from Bureya to Khungari. Gen. Distr.: Japan. Described from Khakhe Island on the Amur, opposite the estuary of Khungary River.

5. *G. nemoralis* Uechtritz et Korn. B. Z. XXIV (1866) 121; Asch. u. Gr. Syn. II, 449; Shmal'g. Fl. II, 638.

Perennial. Resembling *G. plicata*, but culms 30 cm–1 m tall, weak; ligules split into subcapillary divisions; panicle more nodding; spikelets 5–7-flowered; lemmas smooth, 7-nerved, 3 nerves reaching the summit and 4 short nerves alternating with the long ones. June.

Riverside alder-scrubs, more rarely deciduous forests. –European part: Upp. and Mid. Dnep. Gen. Distr.: East. and Centr. Eur. Described from Prussia.

Series 2. *Remotae* Kom. –Spikelets flattened, small; culms slender, soft; spikelet bracts generally obtuse, serrate at the summit.

6. *G. natans* Kom. in Fedde, Repert. sp. nov. XIII (1914) 86; Kom. Fl. Kamch. (Fl. of Kamchatka) I (1927) 182; Kom. end Al. Oprel. (Determin.) I, 222; E. Hulten, Fl. Kamtch. I, 140.

Perennial. Rhizome slender, short, branching, submerged in water, often afloat close to water surface; culms slender, resilient, 20–40 cm long; leaves scabrous, 6–12 cm long and 2 cm broad; ligules 3 mm long. Panicle short, narrow, 4–8 cm long, with bent, scabrous branches; spikelets 4–6-flowered, 2–5 mm long and 1–2 mm broad, oval-oblong; lemmas prominently nerved, the 3–5 middle nerves reaching the apex and exerted in small awn-points. July–August. (Plate XXXIV, Figure 6).

Forming thickets in ponds with shallow stagnant water, shallows, or bogs. –Far East: Kamch., Ussur., Ze. –Bur. (Gilyui River). Endemic. Described from Kamchatka (Mashurskoe Lake). Type in Leningrad.

NOTE. Allied to American *G. pallida* (Torr.) Kntze., recorded also for Japan.

7. *G. lithuanica* (Gorski) Lindm. Engl. Jahrb. (1909) 44; Kryl. Fl. Zap. Sib. II, 309. –*Poa lithuanica* Gorski in Eichw. Skizz. (1830) 117. –*G. norvegica* Sommerf. Vet. Ak. Handl. (1837) 254; Rupr. Pflzk. d. Russ. Reich. IV (1848) 39. –*G. remota* Fr. Mant. II (1839) 5; Griseb. in Ldb. Fl. Ross. IV, 391; Shmal'g. Fl. II, 639. –Exs.: HFR No 2676.

454 Perennial. Rhizome creeping, forming very loose tufts; culms erect, 0.5–1.5 m tall, smooth; leaves 7–9 mm broad, scabrous, thin; ligules 2–3 mm long, thin, often erose. Panicle to 3 cm long, very loose, nodding; panicle branches capillary, thin, scabrous, the lowest mostly with 2 branchlets arising at the base; spikelets 3–6-flowered, to 1 cm long, green; glumes very short, not exceeding 2 mm; lemmas lanceolate, obtuse, prominently nerved; anthers short, to 0.6 mm in length. June–July. (Plate XXXIV, Figure 7).

Wet places in forests, often near streams and springs, sometimes riverside alder-scrubs. –European part: Kar. –Lap., Dv. –Pech., Lad. –Il'm., Upp. Volg., Upp. Dnep., Volg. –Kam., Volg. –Don., Low. Don., Low. Volg.; West. Siberia: Ob. region, Irt., Alt.; East. Siberia: Yenis., Ang. –Sayan., Len. –Kol., Daur.; Far East: Kamch., Ze. –Bur., Ussur., Sakh. Gen. Distr.: Scand., Centr. Eur. (Prussia), Japan. Described from Lithuania.

NOTE. Resembling in appearance *Cinna latifolia* (Trev.) Griseb., but spikelets in that species are 1-flowered.

8. *G. caspica* Trin. in Mém. Acad. Petr., sér. 6, I (1831) Suppl. 57; Griseb. in Ldb. Fl. Ross. IV, 391; Grossg. Fl. Kavk. (Fl. Cauc.) I, 113.

Perennial. Rhizome developed; culms weak, to 60 cm tall; leaves flat, green, rather flaccid, 10 mm broad, their sheaths much shorter than the

internodes, strongly scabrous; ligules short, round. Panicle dense, contracted, often nodding at the top; spikelets green, 5-7 mm long, elliptical-oblong, 3-8-flowered; lemmas prominently 7-nerved, attenuate toward the summit and sometimes acuminate. June-July. (Plate XXXIV, Figure 8).

Shady forests, on wet soil. -Caucasus: East. Transcauc., Tal. Endemic. Described from the forests between Lenkovan'ya and Zuvant (Gogenakker). Type in Leningrad.

9. *G. orientalis* Kom. in Fedde Repert. sp. nov. XIII (1914) 1, 162; Kom. Fl. Kamch. I, 180. -? *G. debilior* Kudo Fl. of Paramuschir (1922) 74, ex descriptione (non Trin.).

457 Perennial. Rhizome creeping; culms 40-140 cm tall, ascending, erect above, smooth; leaves light green, scabrous, somewhat succulent, partitions within the tissue showing through near the ground surface, 10-20 cm long and 1-9 (mostly 6-7) mm broad; ligules short, pointed. Panicle 6-30 cm long, nodding, with capillary, strongly scabrous branches; spikelets 3-6-flowered, to 1 cm long, green, ultimately tawny-purple, laterally compressed; glumes at most to 2 mm long, serrate at the summit, obtuse; lemmas obtuse, prominently 7-nerved. June. (Plate XXXIV, Figure 10).

Solitary or in small groups, in wet meadows, near springs and bodies of water, shade-evading. -Far East: Kamch., Sakh. Gen. Distr.: Kuril'skie Islands. Described from Kamchatka. Type in Leningrad.

ECONOMIC IMPORTANCE. Entering into the composition of meadow hay and regarded as a grass of more than medium quality.

10. *G. alnasteretum* Kom. in Fedde, Repert. sp. nov. XIII (1914) 87; Kom. Fl. Kamch. I, 182; E. Hulten, Fl. Kamch. I, 138.

Perennial. Rhizome strong, creeping; culms 0.8-1.5 m tall; leaves dark green, flat, thin, 5-7 mm broad, scaberulous; ligules broad, round, dentate at the apex, 3 mm long. Panicle 15-20 cm long and broad, with straight, smooth, horizontally spreading branches; spikelets 5-7-flowered, lined up 2-7 on a branchlet, ca. 7 mm long; lemmas acute, 3-4 mm long, with 7 nerves which do not reach the summit, longer nerves alternating with shorter ones, the middle nerve and two of the lateral nerves more prominent, the others rather obscure; caryopsis dark brown, lustrous, oblong, with thin longitudinal wrinkles and a small point at the top; anthers to 1 mm long. June-August. (Plate XXXIV, Figure 9).

Alder thickets in the subalpine zone. -Far East: Kamch. Gen. Distr.: Kuril'skie Islands and Iezo Lake. Described from Kamchatka. Type in Leningrad.

Series 3. *Scolochloiformes* Kom. -Glumes seemingly acute; panicle branches erect; leaves relatively stiff.

11. *G. spiculosa* (Fr. Schm.) Roshev. in Fl. Transbaic. (1929) 85. -*G. paludificans* Kom. Bull. du Jard. Bot. XVI (1916) 152. -*Scolochloa spiculosa* Fr. Schm. Fl. Sachal. (1874) 219. -? *Molinopsis spiculosa* Honda in Journ. Facult. Sc. Univ. Tokyo III (1930) 439. -*Id.*: Kom. and Al. Oprod. (Determin.) I, tab. 60.

Perennial. Rhizome long, creeping, intensely rooting at the nodes; sterile shoots decumbent, with ascending ends; culms ascending at the base, erect above, 20-70 cm tall; leaves long-acuminate, much longer than the internodes, firm, 10-30 cm long and 3-5 mm broad, upright; ligules round.

Panicle loose, with short, erect, slender branches; spikelets ca. 3 mm long, 5-8-flowered, silvery when young, becoming somewhat darker; lemmas folded, seemingly acute, when open prove to be rounded at the summit, with small teeth and 7 prominent nerves. July. (Plate XXXIV, Figure 12).

- 458 Borders of lakes and of cut-off fluvial lakes. The plant contributes to the bogging down of lakes, as it spreads over the water by means of its sterile shoots. - East. Siberia: Len. - Kol., Daur.; Far East: Sakh., Ze. - Bur., Ussur. Gen. Distr.: Jap. - Chin. (Manchuria). Described from Sakhalin. Type in Leningrad.

ECONOMIC IMPORTANCE. In marshy flood-meadows of lower Suifun, where this grass is very abundant, it is cut for hay.

Series 4. *Spectabiles* Kom. - Glumes obtusely rounded or subacute; culms erect, firm, usually tall; panicle erect, with spreading branches.

12. *G. aquatica* (L.) Wahlb. Fl. Gothob. (1820) 18; Griseb. in Ldb. Fl. Ross. IV, 392; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) I, 307. - *G. spectabilis* Mert. et Koch, Deutschl. Fl. I (1823) 586; Shmal'g. Fl. II, 639. - *Poa aquatica* L. Sp. pl. (1753) 67. - *Molinia maxima* Hartm. Handb. ed. I (1820) 56. - *Glyceria maxima* Holmb. Bot. Not. 1919, 97. - *G. altissima* Garcke, Deutschl. Fl. ed. 16 (1890) 500.

Perennial. Rhizome creeping; culms erect, 0.9-2 m tall, relatively thick; leaves light green, ca. 1 cm broad, keeled underneath along the midvein, scabrous on the upper side and on the margin, straplike-linear, long, thin-pointed; ligules ca. 4 mm long, round, those of the middle part pointed. Panicle large, dense, 20-40 cm long, its branches scabrous, set in all directions, bearing numerous spikelets; spikelets 5-9-flowered, greenish, later turning brownish or purple, to 8 mm long; lemmas 7-nerved, scabrous on the back, membranaceous on the margins and at the summit, attenuate-rounded or subacute, entire. June-August. (Plate XXXIV, Figures 13, 16).

Gently flowing streams and rivulets, borders of lakes and straits, banks of big canals, and flooded grassy marshes. Growing in groups or in thick mats, and descending into the water down to 1.5 m deep, rarely deeper. - European part: Kar. - Lap. (south.), Lad. - Il'm., Upp. Volg., Upp. Dnep., Mid. Dnep., Prichern., Volg. - Don., Low. Don., Volg. - Kam., Zavolzh., Low. Volg.; Caucasus: Ciscauc., West. Transcauc. (north); West. Siberia: Ob. region (south. part), Irt., Alt., Upp. Tob.; East.

Explanation to Plate XXXIV

1. *Glyceria fluitans* (L.) R. Br. - 2. *G. plicata* Fries. - 3. *G. nemoralis* Uechtritz et Körn. - 4. 5. *G. leptorhiza* (Maxim.) Kom. - 6. *G. natans* Kom. - 7. *G. lithuanica* (Gorski) Lindm. - 8. *G. caspica* Trin. - 9. *G. sinasteretum* Kom. - 10. *G. orientalis* Kom. - 11. 19. *G. ussuriensis* Kom. - 12. *G. spiculosa* (Fr. Schm.) Roshev. - 13. 16. *G. aquatica* (L.) Wahlb. - 14. 15. *G. arundinacea* (M. B.) Kunth. - 17. *G. triflora* (Korn.) Kom. - 18. *G. kamtschatica* Kom. (In all cases - ligule, spikelet, lemma, stamen).



Siberia: Yenisei, Ang.-Sayan. Gen. Distr.: all Europe except Arctic region and larger part of Medit., Balk.-As. Min. Described from southern Sweden. Type in London.

ECONOMIC IMPORTANCE. This mannagrass is suitable as forage only when young; later it becomes coarse and is attacked by smut (*Ustilago longissima* Tul.) which forms long, narrow, black stripes on the leaves. This fungus is poisonous to cattle in fresh forage, but is harmless in hay; it contains a glucoside which may give rise to prussic acid. The plant can be used for silage. The young internodes of mannagrass, being very sweet, are eaten by children. Mannagrass straw is used for thatching, like the straw of *Phragmites* reed which grows in its proximity.

- 459 13. *G. arundinacea* (M. B.) Kunth, Enum. (1833) 367; Shmal'g. Fl. II, 639; Grossg. Fl. Kavk. (Fl. Cauc.) I, 113. - *Poa arundinacea* M. B. Fl. taur.-cauc. I (1809) 60. - Exs.: HFR No 1145.

Perennial. Differs from the preceding species in thin culms, 0.5-1.5 m tall, and narrow, 5-10 mm broad leaves, the blades of the upper leaves being more twice as long as their sheaths; the leaf blade with a dark spot on each side at base; panicle 15-50 cm long, longer, with more slender branches, and with a smooth main axis; spikelets loose, 3-6-flowered, usually greenish-purple; lemma smooth on the back, more pointed than in *G. aquatica*, with 5-7 nerves. June-July. (Plate XXXIV, Figures 14, 15).

Borders of bodies of water, the base submerged in water, more rarely grassy marshes and marshy meadows in flooded valleys. - European part: Prichern., Low. Don., Low. Volg., Zavolzh.; Caucasus: Ciscauc., East. Transcauc.; West. Siberia: Upp. Tob., Irt. Gen. Distr.: Centr. Europe (Hungary, Galicia), Balk.-As. Min. Described from the Caucasus. Type in Leningrad.

14. *G. triflora* (Korsh.) Kom. sp. nova, Addenda p. 757. - *G. aquatica* var. *debiliior* Trin. in Mém. Ac. Sc. Pétersb. sér. 6, I (1830) 365; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) I, 308 (partly). - *G. aquatica* var. *triflora* Korsh. in A. H. P. XII (1892) 418.

Perennial. Rhizome long, rooting; culms erect, 0.9-1.4 m tall, rather firm; leaves nearly smooth, with a very prominent midvein, more than 1 cm broad; ligules to 3 mm long. Panicle large, 20-30 cm long, rather dense, with the branches numerous, scabrous, the lower ones usually solitary; spikelets oblong, 5-8 mm long, 3-8-flowered, light green, turning reddish or even blackish-purple; glumes 2-3 mm long, obtuse or subacute; lemmas oblong, prominently 7-nerved, obtuse, crenate or emarginate at the summit. July. (Plate XXXIV, Figure 17).

Borders of small cut-off lakes, in groups, often with base in water. - East. Siberia: Daur.; Far East: Ze.-Bur., Ussur., Ud., Sakh. Gen. Distr.: Jap.-Chin. (Manchuria, Korea). Described from the lakelets between Zeya and Bureya. Type in Leningrad.

NOTE. Differs from *G. aquatica* (L.) Wahlb. in the open scanty panicle, brightly colored spikelets, few-flowered spikelets, emarginate, lemmas, and more slender culms; shape of ligule variable.

15. *G. kamtschatica* Kom. sp. nova, Addenda p. 758. - *G. maxima* in Hultén, Fl. Kamtch. I (1927) 139. - *G. aquatica* Kom. Fl. Kamtsch. I (1927) 180.

Perennial. Culms erect, 0.8-1.2 m tall and 5-6 mm in diameter at the base; leaves smooth, relatively narrow, to 7 mm broad. Panicle ca. 30 cm long, open, often nodding at the top, the lowest node with two or three secund branches; spikelets 7-flowered, 8-10 mm long; glumes oval-lanceolate, white or of lighter color than the lemmas and paleas; lemmas oblong, obtusely rounded, uniformly blackish-purple at the summit; anthers orange or darker-colored, 1 mm long; toward the end of flowering spikelets become looser and fragments of the rachilla are clearly visible between individual florets. (Plate XXXIV, Figure 18).

- 460 Swampy stagnant rivers, with base in water. - Far East: Kamch. (tributaries of the middle reaches of Kamchka River, in groups). Endemic. Described from Kamchatka (village of Mil'kovo). Type in Leningrad.

16. *G. ussuriensis* Kom. sp. nova, Addenda p. 758.

Perennial. Rhizome short, forming small tufts; culms erect, firm, 0.6-0.9 m tall, 6-7 mm in diameter, longitudinally veined, scabrous, smooth toward the inflorescence; leaves flat, 6-12 mm broad, ribbonlike, attenuate toward the apex, acute, scabrous, keelless throughout its length; leaf sheaths strongly developed, covering the internodes almost all the way up, with numerous longitudinal veins and prominent transversal partitions between them; ligules round, very short, ca. 2 mm in length, uniform. Panicle dense, soft, many-flowered, 15-25 cm long and 4-12 cm broad, sometimes 1-sided; panicle branches erect, scabrous, the lower ones usually in threes; spikelets 5-7-flowered, 5-8 mm long, light green; glumes whitish, smooth; lemmas white-margined, attenuate toward the summit, subacute, rather prominently 5-nerved; anthers yellow. July-August. (Plate XXXIV, Figures 11, 19).

Borders of brooks and rivulets, in the shade of bottom-land, or in the open on slopes and at forest borders, in hollows with stagnant water in spring. - Far East: Ussur. Endemic (or Jap. - Chin. ?). Described from the valley of Suputinka River, tributary of Sulfun River. Type in Leningrad.

NOTE. Differs in the luxuriant panicle with a large number of spikelets and the culm bearing, in its lower part, broad leaf sheaths which almost cover it up and appear to be tubercular due to transversal partitions inside the air spaces.

Genus 177. *ATROPIS** RUPR.**

In Beitr. Pfl. Russ. Reich. II (1845) 64. - *Puccinellia* Parl. Fl. It. I (1846) 366.

Inflorescence paniculate, open or rather contracted. Spikelets 3-9-flowered. Florets imbricate, 2-ranked. Glumes unequal, shorter than the lemmas, the lower glumes 1-nerved, the upper 3-nerved, without a keel or somewhat keeled. Lemmas 1.5 mm long, obscurely 5-nerved, keeled or rounded on the back, obtuse, subacute, or acute, mostly hyaline and

* From Greek *a* - negation, and *tropis* - keel.

** Compiled by V. I. Kretchetovich. - Manuscript modified by the editors as regards nomenclature and subdivisions.

ciliate on the margin. Palea as long as the lemma, with 2 mostly ciliate (sometimes glabrous) keels, emarginate-bidentate at the summit, hairy or glabrous at the base. Lodicules 2, free. Stamens 3. Pistils with sessile plumose stigmas. Caryopsis oblong, not furrowed, falling together with lemma and palea. Perennials, tufted.

- 461 **ECONOMIC IMPORTANCE.** Species of *Atropis* should be of considerable value in steppe conditions, especially in Kazakhstan and Bashkiriya, as they are of great forage value (see Larin, Vved. v izuch. est. korm. Kazakh. (Introd. to Nat. Fodders of Kazakhstan) 1927, 22, and also Trudy Kazakh. eksp. Akad. Nauk (Rep. Kazakh. Exped. of Acad. Sci.) No VII), and local practice accords them a leading position. "Ak-mamyk", as *Atropis* is called by Kazakhs, grows well even under most extreme conditions of salinity, and may be used essentially as a crop for worthless solonchak meadows after suitable improvements (irrigation, etc.). According to observations in Ural' Oblast', "Ak-mamyk", cut at the onset of flowering, furnishes hay which is not inferior to best meadow sedge hay, and it is considered as an excellent fattening feed for horses. When mature, it becomes coarse and is no longer eaten by livestock. It yields on the average 800 to 1,000 kg of hay per hectare (in good years even up to 3,000 kg).

Of particular importance in steppe conditions ought to be the species: 27, 32, 33, 34, 35, 36, 37, and 38; in the sand-desert regions of central Asia and Aralo-Caspian - 29, 30, and 31; in mountains - 10, 12, and 25; and in normal forest-steppe conditions and in meadows, the following species deserve mention on account of their large herbage yields: 4, 16, 17, 23, and 26 (the above-mentioned species 19 and 30 attain most luxurious development in sandy steppe conditions).

NOTE. Since glumes undergo deformation in fruiting plants, and there are a number of species with intermediate characters as regards presence of keel, roundness of the back, etc., it is necessary to check identification also at the section and series level.

1. Axis and branches of inflorescence smooth (occasionally axis and branches with scattered, sparse prickles below the spikelets - especially in the terminal ramifications - but not scabrous all over) 2.
- + Axis and branches of inflorescence scabrous all over 18.
2. Anthers 1.5-2 mm long; lemmas (2.5) 3-4 (5) mm long 3.
- + Anthers 0.6-1.2 (1.5) mm long; lemmas mostly 2-2.5 (sometimes 3) mm long 9.
3. Maritime plants (Atlantic and Pacific), loosely tufted, often with long creeping stolons 4.
- + Mountain and high-mountain plants (centr. Asia and Caucasus), densely tufted, not stoloniferous 6.
4. Lemmas hairy at the base; palea ciliate on the keels; spikelets dense, 5-9-flowered. A large plant (Plate XXXV, Figure 1 a-e, - north-western Europe) 1. *A. maritima* (Huds.) Richt.
- + Lemmas glabrous at the base; palea glabrous on the keels. Spikelets loose, 2-5-flowered. Squat plants 5.
- 462 5. Stolons long, flexuous; panicle short, with few spikelets; lemma triangular at the summit (Arctic) 2. *A. phryganodes* (Trin.) V. Krecz.

- + Stolons lacking; panicle with many spikelets; lemmas gradually attenuate above, obtuse (Okhotskoe Coast) 3. *A. geniculata* (Turcz.) V. Krecz.
6. Panicle contracted, narrow, the branches only slightly divergent from inflorescence axis 7.
- + Panicle divaricate or diffuse, sometimes initially contracted 8.
7. A squat plant; spikelets 5-8-flowered, with spreading, drawn-out florets, up to 1-1.2 cm long. Lemmas 4-5 mm long. Panicle branches short (1-2 cm), bearing 1 or 2 spikelets, hence inflorescence spike-like (Plate XXXV, Figure 7 a-e. - Tyan'-Shan, Alai) 11. *A. subspicata* V. Krecz.
- + A tall plant; spikelets 3-4-flowered, compressed, dense, to 0.5 cm long. Lemmas 3-4 mm long. Panicle branches elongated (3-4 cm), bearing numerous spikelets. (Plate XXXV, Figure 6 a-e) 10. *A. pamirica* (Roshev.) V. Krecz.
8. Palea glabrous on the keels, smooth. (Plate XXXV, Figure 7, b and c). Spikelets obovate, somewhat spreading; panicle branches short, thickened, with spikelets appressed to inflorescence axis. Culms geniculate, with broad lower sheaths. (East, Tyan'-Shan, Pamir) ... 12. *A. pauciramea* (Hack.) V. Krecz.
- + Palea densely setulose on the keels. (Plate XXXV, Figure 9, b and c). Spikelets lanceolate, compressed; panicle branches long, capillary, with spikelets arranged singly on spreading secondary branches. Culms erect, the lower sheaths closely clasping the culm (Armenia) 13. *A. Grossheimiana* V. Krecz.
9. (2). Lemmas glabrous at the base; palea smooth on the keels (or with few small bristles at the very summit) 10.
- + Lemmas more or less hairy at the base; palea rather scabrous on the keels 11.
10. Spikelets small, borne on capillary branches of a spreading panicle; the upper glume 1 mm, the lower 0.5 mm long; lemmas 1.5-1.6 mm long, subrounded at the summit, ciliate, obscurely nerved. (Plate XXXVIII, Figure 33 - Siberia) 40. *A. tenuiflora* (Turcz.) Griseb.
- + Spikelets oblong, borne on straight, short branches of a short, open panicle. The upper glume to 2 mm long, the lower 1-1.5 mm long; lemmas 2-2.5 mm long, glabrous on the margin, with a projecting blunt point; nerves thickened, very prominent (Chukotskii Peninsula) 22. *A. laeviuscula* V. Krecz.
- 463 11. Branches studded all the way down with appressed spikelets. Leaves to 4 mm broad, flat, with broad sheaths, covering the lower part of inflorescence (Plate XXXVII, Figure 17 - Kamchatka) 20. *A. alaskana* (Scribn. et Merr.) V. Krecz.
- + Spikelets pediceled, only on terminal part of the branches. Leaves not more than 2-2.5 mm broad, flat or involute, with narrow sheaths 12.
12. Lemmas 2-2.5 mm long, triangular or round-truncate at the summit (Plate XXXV, Figure 33 or Plate XXXVI, Figure 22) 13.
- + Lemmas 3-4 mm long, gradually attenuate toward the summit (Plate XXXV, Figure 5 c) 16.

13. Dwarf plants, 5-30 cm tall (arctic); panicle 3-7 cm long, branches straight, thickened, 2-3 mm long. Leaves rather flat, as long as the culm 14.
- + Tall plants, 30-60 cm in height (steppe); panicle open, large, 7-20 cm long, branches capillary, more or less flexuous, 5-10 cm long. Leaves setaceous-involute, exceeded in length by the culm several times 15.
14. Upper glume very broad and hence somewhat folded, unevenly and broadly obtuse at the summit, 1.5-2 mm long; lower glume 1 mm long. Lemmas roundly obtuse and ciliate at the summit. Spikelets 3-4-flowered, loose. (Plate XXXVII, Figure 16). A small plant, 5-15 cm tall (Arctic) 21. *A. tenella* (Lge.) V. Krecz.
- + Upper glume ovate, obtuse, 2-2.5 mm long, lower glume 1-1.5 mm long. Lemmas triangular-obtuse at the summit. Spikelets 3-6-flowered, dense. Plant 10-30 cm tall (Pacific coast) 19. *A. paupercula* (Holm.) V. Krecz.
15. Spikelets linear-lanceolate, borne on divergent pedicels. Lemmas rounded at the summit (northern part of central Asia) 37. *A. diffusa* V. Krecz.
- + Spikelets lanceolate, appressed to inflorescence branches; lemmas with a blunt projecting point at the summit. (Plate XXXVII, Figure 25 c and e - Transcaucasia) 38. *A. bulbosa* Grossh.
16. (12). Plants 5-15 cm tall, rigid, grayish-green, densely tufted (a high mountain plant); leaves involute. Panicle spikelike, with short appressed branches (Alai, Tien Shan) 9. *A. humilis* (Litw.) V. Krecz.
- + Plants 10-50 cm tall, not rigid, light green, rarely tufted. Leaves rather flat. Panicle contracted at first, becoming open, with rather long branches 17.
17. Plants 10-20 cm tall, with a racemiform, dense, somewhat 1-sided panicle, 3-5 cm long; branches 2-3 cm long; spikelets purple. Lemmas silvery-hairy on the middle and lateral nerves (Plate XXV, Figure 4 - Arctic) 7. *A. angustata* (R. Br.) V. Krecz.
- 464 + Plants 25-50 cm tall; the open panicle 8-15 cm long, with long branches (5-7 cm); spikelets green. Lemmas short-pilose only at the base (Pacific Coast) 8. *A. kurilensis* Takeda.
18. (1). Lemmas 1.5-1.8 mm long, without a keel, broadly rounded at the summit. (Plate XXXVI, Figures 21 and 22) 19.
- + Lemmas (1.8) 2-3 mm long or longer (to 4.5 mm), convex or keeled, rounded or pointed at the summit 21.
19. Spikelets small, 2-3 mm long; lemmas glabrous at the base, 1.5-1.6 mm long. The upper glume 1 mm long, the lower ca. 0.5 mm long 20.
- + Spikelets large, 4-5 mm long; lemmas hairy at the base, 1.7-1.8 mm long; palea markedly longer than the lemma. The upper glume 1.5 mm long, the lower to 1 mm (the whole of Siberia) 26. *A. Hauptiana* (Trin.) V. Krecz.
20. Spikelets purple, 2-3-flowered; lemma and palea of equal length. Anthers 0.9-1.1 mm long. (Plate XXXVIII, Figure 33). A large plant with a large, open panicle (Sayany, Dauriya) 40. *A. tenuiflora* (Turcz.) Griseb.
- + Spikelets green, 3-5-flowered; palea longer than the lemma. Anthers 0.4 mm long. (Plate XXVI, Figure 22). Dwarf plant, with a

- small, contracted, ultimately somewhat spreading, panicle (valley of the river Il'ya) 27. *A. iliensis* V. Krecz.
21. Anthers from 0.5-1 mm long 22.
- + Anthers from 1-2 mm long 31.
- 22.* Lemmas keelless, subrounded-truncate at the summit (see Plate XXVI, Figures 20c, 19c, 18c, 12c) 23.
- + Lemmas keeled on the back, triangular-truncate or gradually acuminate (see Plate XXXVII, Figure 15c, Plate XXXVI, Figures 10c, 11c, 14c) 27.
23. Lemmas glabrous at the base. Anthers broad, 0.4-0.5 mm long. (Plate XXXVII, Figure 23c and d - Armenia) 28. *A. sevangensis* (Grossh.) V. Krecz.
- + Lemmas more or less pilose at the base. Anthers 0.6-1 mm long 24.
24. Lemmas 2.5-3 mm long 25.
- + Lemmas ca. 2 mm long 26.
- 467 25. A sprawling-tufted plant, 10-35 cm tall, stiff, grayish-purple, with involute leaves and purple spikelets; panicle short, 5-10 cm long (high-mountain plant). Lemmas slightly triangular-rounded at the summit, purple, scarious-margined, uneven. Palea slightly hairy at the base. Anthers 0.8-1 mm long. (Plate XXXVI, Figure 20 - Pamiro-Alai, Tyan'-Shan) 25. *A. Hackelia* V. Krecz.
- + A plant with erect stems, tussocky, 50-80 cm tall, rather soft, green, with flat abundant leaves and green spikelets. Panicle to 25 cm long. Lemmas rounded at the summit; palea hairless at the base. Anthers 0.6-0.7 mm long. (Plate XXXVI, Figure 12 - west. Siberia) 16. *A. sibirica* (Holmb.) V. Krecz.
26. A green plant, thickened and short in its various parts; branches short (to 5-6 cm long), shortened supplementary branches at the nodes. Glumes obtuse; lemmas subtruncate (Plate XXXVI, Figure 18) - Europe, east. Siberia) 23. *A. distans* (L.) Griseb.
- + A grayish-green plant; branches slender, elongate (up to 7-10 cm), shortened supplementary branches lacking. Upper glume subacute; lemmas rounded at the summit (Plate XXXVI, Figure 19 - centr. Asia) 24. *A. glauca* (Rgl.) V. Krecz.
27. (22). Palea markedly longer than the lemmas. (Plate XXXVII, Figure 15c - Kamch., Yakutiya) 17. *A. kamtschatica* (Holmb.) V. Krecz.
- + Palea and lemma equal 28.
28. Lemmas 2-2.5 mm long. Anthers 0.5-0.8 mm long. Plants 10-30 cm tall 29.
- + Lemmas 3-4 mm long. Anthers 0.8-1 mm long. Larger plants, 20-50 cm tall 30.
29. Plants forming dense, cushion-like tufts, with short culms in the center and long, decumbent culms at the periphery. Glumes lanceolate, subacute. Lemmas glabrous at the base; anthers 0.5-0.6 mm long. (Plate XXXVI, Figure 11 - Northern Europe) 15. *A. pulvinata* (Fr.) V. Krecz.
- + Plants forming small tufts, with radiating culms of equal length. Glumes ovate, obtuse. Lemmas hairy at the base; anthers 0.6-0.8 mm

* in the absence of properly collected young plants, this stage is liable to lead to confusion.



long. (Plate XXXVI, Figure 14-estuaries of Amu-Dar'ya) 18. *A. choresmica* V. Krecz.

30. Glumes oblong-lanceolate, subacute, the upper glume 3-3.5 mm long, the lower 2 mm long. Lemmas gradually attenuate toward the summit, 3-4 mm long, not ciliate. Anthers 1 mm long. (Pacific coast) 8. *A. kurilensis* Takeda.

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- + Glumes oblong-ovate, subobtusate, the upper 2-2.5 mm long, the lower 1.5 mm long. Lemmas triangular-subobtusate at the summit, 3-3.5 mm long, ciliate. Anthers 0.8-0.9 mm long. (Plate XXXVI, Figure 10-Northwestern Europe) 14. *A. suecica* Holmb.
- 31*. (21). Lemmas obtuse, triangular to subrounded at the summit, more or less convex on the back. (Plate XXXVIII, Figures 26 and 32) . . 32.
- + Lemmas triangular-pointed at the summit (Plate XXXV, Figures 2 and 9; Plate XXXVIII, Figure 27) or rounded, with a projecting point in the center, more or less keeled on the back. (Plate XXXVII, Figures 24 and 25) 33.
32. Lemmas narrow, oblong-ovate. (Plate XXXVIII, Figure 32). Spikelets elliptical, 3-4 mm long. Panicle slender, loose, few-flowered. Culms very slender (0.5-1 mm), smooth, with filiform-involute leaves, closely enveloped by narrow sheaths. (A plant of dark-colored solonets soils in the needlegrass-steppe and needlegrass-mixed-grass-steppe belt) 36. *A. tenuissima* (Litw.) V. Krecz.
- + Lemmas broadly obovate, broadly enclosing the short and narrow paleas, imbricate, forming oblong spikelets 5-7 mm long. (Plate XXXVIII, Figure 26). Panicle large, open, the branches of equal length, bearing a fascicle of shortened branchlets at the base. Culms thickened (up to 2-2.5 mm in diameter), scabrous below the inflorescence, bearing flat or canaliculate leaves to 2.5 mm broad and enveloped by loose sheaths at the base. (Solonets soils of the submontane part of Central Asia) 31. *A. anisoclada* V. Krecz.
33. Anthers from 1.6-2 mm long 34.
- + Anthers from 1-1.6 mm long 38.
34. Lemmas glabrous at the base; spikelets lanceolate, 3-4-flowered, 4-5 mm long, borne on divergent and slender secondary branches of an open panicle (Armenia) . . . 13. *A. Grossheimiana* V. Krecz.
- + Lemmas pilose at the base; spikelets oblong, 4-9-flowered, borne on appressed secondary branches of spreading panicles 35.

* See note at stage 22.

Explanation to Plate XXXV

1. *Atropis maritima* (Huds.) Richt. -2. *A. macranthera* V. Krecz. -3. *Colpodium* Kjellmansi (Lge) Nevski. -4. *A. angustata* (R. Br.) V. Krecz. -5. *A. humilis* (Litw.) V. Krecz. -6. *A. pamirica* (Rohrer.) V. Krecz. -7. *A. subspicata* V. Krecz. -8. *A. Grossheimiana* V. Krecz. -in all figures: a) glumes; b) lemma and palea from the side; c) lemma and palea in front view; d) anthers; e) portion of inflorescence.

35. Glumes obtuse (Plate XXXV, Figure 2, a); plants with subinvolute or flat leaves to 3-5 mm broad, free sheaths, and 5-9-flowered spikelets 36.
- + Glumes subacute (Plate XXXVIII, Figure 27, a); plants with setaceous-involute leaves (not more than 2 mm broad), tightly adherent narrow sheaths, slender culms, and 3-5-flowered spikelets. (Solonchaks soils of wormwood or fescue-wormwood steppes) 33. *A. dolicholepis* V. Krecz.
- 469 36. Lemmas narrowly ovate, gradually acuminate, 4-4.5 mm long. (Plate XXXV, Figure 4, c and b) 4. *A. jennisseiensis* Roshev.
- + Lemmas obovate, broadly triangular at the summit, sometimes distinctly mucronate, 2.3-3 mm long 37.
37. Spikelets linear, dense, 6-9-flowered. Lemmas covered with long hairs on the nerves to a considerable distance from the base; palea spinulose only toward the summit (East. Caucasus) 6. *A. poecilantha* (C. Koch) V. Krecz.
- + Spikelets oblong-elliptical, loose, 5-6-flowered. Lemmas hairy only at the base; palea ciliate on the keels, hairy at the base (Sayano-Mongolian region) 5. *A. macranthera* V. Krecz.
38. (33). Lemmas 1.8-2 mm long, broadly rounded at the summit, with a projecting blunt point (Plate XXXVII, Figure 25, c); spikelets dark purple (Transcaucasia) 38. *A. bulbosa* Grossh.
- + Lemmas more than 2 mm long, subobtusely triangular at the summit (Plate XXXVIII, Figures 30, c and 29, c); spikelets green, light purple 39.
39. Large rather flaccid plants, 80-150 cm tall, with abundant, flat or subinvolute, rather flaccid leaves, up to 4-5 mm broad. Panicle 20-30 cm long, diffuse, branches to 15 cm long. Culms scabrous below the inflorescence 40.
- + Smaller plants, 40-80 cm tall, with stiff short leaves (not more than 2.5-3 mm broad). Panicle 5-15 cm long, diffuse; branches up to 5-7 cm long. Culms smooth 41.
40. A loosely tufted plant; leaves rather long, abruptly pointed; lemmas 2-2.5 mm long (Transcaucasia, Western Turkmenistan) 29. *A. gigantea* Grossh.
- + A densely tufted plant; leaves rather short, strongly tapering to a rather sharp point. Lemmas 2.5-3 mm long (South Kazakhstan) 30. *A. chilochloa* V. Krecz.
41. Culms covered to a considerable distance from the base with old, transparent, fibrillose-membranaceous sheaths. Culms erect, rather slender. Panicle short, rather contracted, narrow. Spikelets linear-lanceolate, 2-3-flowered. Lemmas glabrous at the base (sands of eastern Pribalkhash'e) 35. *A. macropus* V. Krecz.
- + Culms without membranaceous sheaths at the base. Panicle divaricate; spikelets oblong, 4-7-flowered. Lemmas pubescent at the base 42.
42. A large plant, to 80 cm tall. Panicle oblong, branches glabrous at the base, densely setose-spinescent toward the apex and close to spikelets. Lemmas 3-3.5 mm long. (Zaissan, Karkaraly) 39. *A. Roshevitsiana* Schischk.
- 470 + A plant to 40-50 cm tall; panicle more or less pyramidal-ovoid, branches scabrous at the way down. Lemmas 2-2.5 mm long 43.

43. A glaucous-yellow, rigid plant. Culms thickened (to 3 mm in diameter). Leaves short, folded (to 3 mm broad), the broad sheaths light brown in lower part (Aralo-Caspian and Balkhash semi-desert) 34. *A. sclerodes* V. Krecz.
- + A grayish-green, less rigid plant. Culms slender (to 1 mm in diameter). Leaves longer, setaceous, the brown sheaths closely enveloping the culm. (Steppe part of the Ukraine) 32. *A. convoluta* (Kth.) Grisb.

Section 1. *Parachloa* V. Krecz. -Robust, broad-leaved plants, often stoloniferous. Lemmas keeled, obovate, 3-3.5 mm long, triangular-truncate at the summit. Anthers large, mostly ca. 2 mm long.

Series 1. *Littorales* V. Krecz. -Plants mostly producing creeping stolons. Panicle branches smooth. Glumes and lemmas glabrous on the margin.

1. *A. maritima* (Huds.) Richt. Pl. Eur. (1890) 92. -*Puccinellia maritima* Parl. Fl. It. I (1850) 370 p.p. -*Poa maritima* Huds. Fl. Angl. (1762) 35. -Exs.: Dorfl. No 5389.

Perennial. A robust, glaucous plant with long stolons; culms up to 40 cm tall; leaves straight, up to 3 mm broad, flat or involute. Panicle 7-10 cm long, with short, smooth branches, contracted, ultimately divaricate; spikelets dense, 5-9-flowered, oblong, 8-10 mm long; glumes ovate, obtuse, the upper glume 2.5-3 mm long, the lower glume up to 2 mm long; lemma obovate, more or less keeled, 3-3.5 mm long, distinctly nerved, triangular, obtuse at the summit, pilose below, mostly purple; palea with keels entirely ciliate; anthers 2 mm long, oblong. July. (Plate XXXV, Figure 1).

Coastal sands. -Arctic: Arct. Eur.; European part: Dv. -Pech. Gen. Distr.: Atl. Eur. Described from England. Type in London.

2. *A. phryganodes* (Trin.) V. Krecz. comb. nova. -*Puccinellia phryganodes* Scribn. et Merr. in Contr. U.S. Nat. Herb. XIII (1910) 78. -*Poa phryganodes* Trin. in Mém. Ac. Pétersb. sér. 6, I (1830-31) 389. -*Glyceria vilfoidea* (Anderss) Th. Fr. in Övers. Vet. Ak. Förh. (1862) 254. -*G. angustata* Griseb. in Ldb. Fl. Ross. IV (1853) 390, p.p., non R. Br. -*G. reptans* Krock. in Bot. Not. (1894) 140.

Perennial. A green plant with long stolons; culms 5-15 cm tall; leaves involute, up to 2 mm broad. Panicle 3-5 cm long, with a small number of few-flowered, smooth branches which become spreading and reclinate; spikelets loose, 3-4-flowered, oblong, 6-8 mm long; glumes obtuse, the upper glume 2.5-3 mm long, the lower to 2 mm long; lemmas ovate, 3 mm long, keeled, triangular at the summit, subacute or subobtuse, obscurely nerved, uneven-margined, glabrous below; palea smooth on the keels; anthers narrowly linear, rather pointed, 2 mm long. July.

471 Maritime shallows. -Arctic: Nov. Zem., Arct. Eur. (Vaigach); Chuk. Gen. Distr.: N. Am. Arctic Regions. Described from Alaska (Kotzebue Sound). Type in Leningrad.

3. *A. geniculata* (Turcz.) V. Krecz sp. nova in Addenda, p. 758. -*A. angustata* Griseb. in Ldb. Fl. Ross. IV (1853) 390, quoad pl. ochotensem. -*Puccinellia geniculata* V. Krecz. (manuscr.). -*Poa nutkaensis* Trin. in Mém. Ac. Sc. St. Pétersb., 6 ser., II suppl. (1838) 69, p.p. -*P. geniculata* Turcz. in sched.

Perennial. A loosely tufted plant; culms 10-30 cm tall; leaves abundant, to 2 mm broad, involute, smooth, shorter than the culm subacute. Panicle

3-8 cm long, with smooth, initially appressed, ultimately spreading branches; spikelets loose, 2-5-flowered, oblong, 5-7 mm long; glumes obtuse, the upper 2-2.5 mm long, the lower 1.5 mm long; lemmas ovate, 3-3.5 mm long, gradually tapering toward the summit, obtuse, glabrous at the base, obscurely nerved, slightly purple; palea smooth on the keels; anthers 1.3-2 mm long. July.

Sea coast, -Far East: Okhotsk. Endemic. Described from this area. Type in Leningrad.

Series 2. Continentales V. Krecz. -Stolons lacking; panicle branches scabrous; glumes and lemmas ciliate on the margin.

4. *A. jennisseiensis* Roshev. in Bull. Jard. Bot. USSR XXX (1932) 300. -*Puccinellia jennisseiensis* V. Krecz. in sched.

Perennial. A green, rather soft, tussock-forming plant; culms more or less geniculate at the base, 25-40 cm tall, slender toward the top; leaves flat, 2-2.5 mm broad, half as long, as the culm. Panicle loose, open, 8-15 cm long, their main axis and branches capillary, dispersed-scabrous, flexuous; spikelets solitary, terminal, oblong, 0.8-1 cm long, 5-7-flowered, more or less purple; glumes oblong-ovate, subobtuse, the lower 2 mm long, the upper 2.5-3 mm long, obtuse and often uneven at the summit; lemmas oblong-obovate, 4-4.5 mm long, gradually tapering toward the summit, keeled, uneven-margined, ciliate, more or less hairy at the base, light purple with a yellow margin; palea ciliate over the entire length of keels, narrower and shorter than the lemma; anthers oblong, 2 mm long.

Meadows, river banks. -Arctic: Arct. Sib. (along Yenisei). Described from the river Yenisei, at 71°43' N lat., from Zverevskii sand. Type in Leningrad.

5. *A. macranthera* V. Krecz. sp. nova in Addenda, p. 758. -*Puccinellia macranthera* V. Krecz. (in manuscr.).

Perennial. A bluish-green, rigid, tufted plant; culms geniculate at the base, 30-50 cm tall, covered to a considerable height with loose, scabrous sheaths; lemmas broad; leaves flat or subinvolute, to 4-5 mm broad, scabrous on the upper surface and on the margin. Panicle loose, ovoid-pyramidal, 10-20 cm long, its branches and main axis very scabrous, branches ultimately horizontal or reclinate; spikelets oblong-elliptical, 4-6-flowered, variegated, 5-6 mm long; glumes ovate, obtuse or subobtuse, ciliate, the upper to 2 mm long, the lower to 1-1.5 mm long; lemmas conically ovate, more or less keeled, 2.3-3 mm long, triangular, obtuse, ciliate at the summit, purple, golden-margined, the distinct nerves copiously hairy toward the base; palea ciliate on the margin, hairy below; anthers thickened, oblong, 1.6-2 mm long. May-June. (Plate XXXV, Figure 2).

Solonchak meadows and borders of lakes. -East, Siberia: Ang. -Sayan. Daur. Endemic. Described from Shiro Lake, Minusinskii Raion. Type in Leningrad.

6. *A. poecilantha* (C. Koch) V. Krecz. comb. nova. -*A. festucaeformis* auct. fl. Cauc., non Boiss., p.p. -*Puccinellia poecilantha* V. Krecz. in sched. -*Festuca poecilantha* Koch in Linnaea XXI (1848) 411.

Perennial. Glaucous, rather short in all parts, tufted; culms geniculate at the base, thickened, 25-40 cm tall; leaves subinvolute or folded, to

3 mm broad, stiff, short, abruptly narrowed to a point. Panicle oblong, 10-15 cm long, contracted, with ultimately spreading branches; branches and inflorescence axis scabrous; spikelets in clusters at the end and base of branches, oblong, 6-9-flowered, 6-8 mm long; glumes obtuse, ciliate, the upper glume ovate, rounded-obtuse at the summit, up to 2 mm long, the lower oblong-ovate, to 1.5 mm long; lemmas obovate, keeled, 2.5-3 mm long, abruptly truncate, mucronate, uneven-margined, ciliate, purple, broadly golden-margined, the obscure nerves pilose in lower part; palea setulose on the keels toward the summit; anthers oblong, 1.5-2 mm long. May.

Solonets sites. -Caucasus: East. Transcauc., Dag. Endemic. Described from Apscheron. Type in Berlin.

Section 2. *Cryochloa* V. Krecz. -Lemmas keeled, ovate, (2.8) 3-4 mm long, gradually acuminate, subobtusate, ciliate, straight-keeled, more or less hairy at the base. Anthers ca. 1 mm long.

Series 1. *Boreales* V. Krecz. -Rather well developed plants. Leaves usually long, of equal length and about as long as the culm. Panicle loose, ultimately rather open.

7. *A. angustata* (R.Br.) V. Krecz. comb. nova. -*Poa angustata* R.Br. in Chl. Melv. (1832) 223. -*Glyceria angustata* Fr. in Nov. fl. Suec., Mant. III (1842) 176. -*G. gracilis* Palib. in Bull. Jard. Bot. Pétersb., III (1903) 46.

Perennial. A tufted plant; culms 8-20 cm tall, mostly as long as the leaves or slightly longer than the lower ones; leaves flat, to 2-2.5 mm broad, rather smooth; the lower sheaths rather narrow. Panicle racemose, more or less 1-sided, 3-5 cm long, ultimately diffuse; branches smooth, 2-3 to 3 cm long; spikelets loose, 3-5-flowered, oblong, 5-8 mm long, purple; glumes subobtusate, uneven-margined, the upper ovate, 2.5-3 mm long, the lower oblong-ovate, 1.8-2 mm long; lemmas ovate, more or less keeled, 4 mm long, gradually tapering toward the summit, subobtusate, uneven-margined and faintly golden-colored, purple below, hairy on the nerves at the base; palea somewhat shorter, scattered-setose on the keels toward the summit, occasionally pilose below; anthers oblong, 1 mm long. July-August. (Plate XXXV, Figure 4).

Tundra. -Arctic: Nov. Zem. Gen. Distr.: Eur. and Amer. Arctic Regions. Described from Melville Island.

8. *A. kurilensis* Takeda in Journ. Linn. Soc. (bot.) XLII (1914) 497. -*A. distans* f. *thermale* Kom. in Fl. penins. Kamtsch. I (1927) 183. -*Puccinellia kurilensis* Honda in Journ. Fac. Sci. Univ. Tokyo (bot.) III, 1 (1920) 59. -*P. kamtschatica* var. *sublaevis* Holmb. in Bot. Not. (1927) 209; Holmb. in Hult. Fl. Kamtsch. I (1927) 142.

Perennial. A bushy-tufted plant. Culms 25-50 cm tall, mostly erect; leaves long (though only half as long as the culm), thin, flat, to 2 mm broad, smooth. Panicle oblong, 8-15 cm long, contracted, ultimately open; branches longer (to 5-7 cm long), smooth or somewhat scabrous only toward the summit; spikelets oblong, 4-7-flowered, green or variegated, 5-8 mm long; glumes oblong-lanceolate, subacute, the upper 3-3.5 mm long, the lower 3 mm long; lemmas oblong-lanceolate, more or less convex, 3-4 mm long, gradually tapering, subobtusate, sparsely short-pilose in lower part on the obscure nerves, green, faintly golden on the margin; palea ciliate on the nerves only toward the apex; anthers oblong, 1 mm long. July.

Maritime flats, flood-meadows. -Far East: Kamch., Sakh., Ussur.
Gen. Distr.: Kuril'skie Islands. Described from there: from Shikotan
Island. Type in Tokyo.

Series 2. *Alpicolae* V. Krecz. -Dwarf plants. Panicle spiciform-
contracted, slightly raised above the leaves. Culms densely enveloped by
old sheaths.

9. *A. humilis* (Litz.) V. Krecz. sp. nova in Addenda, p. 759. -*A.*
convoluta var. *acutiuscula* Hack. in A.H.P. XXI (1903) 442. -
Puccinellia humilis Litw. (in manuscr.).

Perennial. A grayish-green plant, forming dense tufts; culms erect,
5-15 cm tall, densely enveloped by old yellowish-brown sheaths; leaves
involute, smooth, short. Panicle oblong, contracted, lobed, 2-4 cm long,
the axis and branches smooth; spikelets in 1's-2's, elliptical, 5-6-
flowered, loose, 6-7 mm long, light purple or mauve-purple; glumes ovate,
obtuse or subacute, the upper glume 2.5-3 mm long, the lower 2-2.3 mm
long; lemmas ovate, more or less keeled, 3.5-4 mm long, faintly convex,
gradually tapering, subobtuse, hairy at the base, obscurely nerved, pale
purple, with membranaceous margins; palea shorter, setulose on the keel
at the summit; anthers oblong, 1-1.1 mm long, purple. (Plate XXXV,
Figure 5).

Centr. Asia: Pam.-Al. (in the alpine zone, at an altitude of 3,000-
3,600 m, on Alai and Transalai ranges). Endemic. Described from Taldyk
Pass. Type in Leningrad.

474 Section 3. *Hiphelocloa* V. Krecz. -Lemmas as in *Cryochloa*, but
more or less acute, glabrous on the margin and at the base, keel convex.
Anthers ca. 2 mm long.

10. *A. pamirica* (Roshev.) V. Krecz. sp. nova in Addenda, p. 760. -
A. tenuiflora Hack. in A.H.P. XXI; 3 (1903) 403 exp. -*A. distans*
f. *pamirica* Roshev. in A.H.P. XXXVIII (1924) 121. -*Puccinellia*
pamirica V. Krecz. msr. -*Colpodium pamiricum* Litw. in shed.

Perennial. A bluish-green or purple-green, shining plant; culms erect
from a geniculate base, 20-40 cm tall, closely enveloped at the base by
light, somewhat shining sheaths; leaves smooth, involute, short, scabrous
on the inside. Panicle remaining contracted after flowering, 7-10 cm long,
the branches smooth, short; spikelets on smooth pedicels, pointed-ovate,
3-4-flowered, compact, to 5 mm long; glumes ovate, subobtuse, uneven-
margined, the upper 2-2.5 mm long, the lower 1.5-1.8 mm long; lemmas
oblong- and somewhat pyramidal-lanceolate, 3-4 mm long, convex, keeled,
rather gradually acuminate, glabrous at the base, distinctly nerved, purple,
hyaline-margined; palea scattered-setulose on the keels toward the summit,
shorter than the lemma; anthers oblong, 1.8-2 mm long, purple. July.
(Plate XXXV, Figure 6).

Wet banks near brackish water, at an altitude of 3,600-3,900 m. -
Centr. Asia: Pam.-Al. (south). Endemic. Described from Kara-kul'
Lake, Suok-chubyr'. Type in Leningrad.

11. *A. subspicata* V. Krecz. sp. nova in Addenda, p. 759. -
Puccinellia subspicata V. Krecz. (in manuscr.).

Perennial. A pale green or grayish-green, rather soft plant; culms
3-15 cm tall; leaves soft, somewhat falcate, subacute, rather flat (to 2 mm
broad), or folded, smooth on the outside; lower sheaths close-fitting, brown.
Panicle oblong, 1-5 cm long, spiciform, with a small number of short.

smooth branches (the lower ones 1-2 cm long), each bearing 1-2 spikelets; spikelets oblong, loosely 3-7-flowered, 0.8-1 cm long; glumes ovate, sub-obtuse, purple, the upper 2-2.5 mm long, the lower 1-1.5 mm long; lemmas elliptical or ovate, 4-5 mm long, abruptly narrowed to a point, keeled, convex, distinctly nerved, glabrous at the base, green at the middle, and purple above, membranaceous on the margin; palea shorter, sparsely setose on the keels toward the summit; anthers oblong, 2 mm long, dark-colored. June-July. (Plate XXV, Figure 7).

- 477 Mountain meadows. -Centr. Asia: (except southern part), Tyan'-Shan. Endemic. Described from southern slopes of Gissarskii Range, Su-bashi. Type in Leningrad.

12. *A. pauciramea* (Hack.) V. Krecz. sp. nova in Addenda, p. 760. -*Atropis distans* f. *pauciramea* Hack. in A.H.P. XXI (1913) 442. -*Puccinellia pauciramea* V. Krecz. (in manuscr.). -*P. angustata* var. *glabrata* Litw. inedit.

Perennial. A grayish-green or bluish-green plant; culms geniculate at the base, 20-30 cm tall, rounded-3-angled in section; lower sheaths broad, rose-light brown-colored; leaves involute, short, forming a brushlike bunch below. Panicle contracted, 4-6 cm long, ultimately divaricate, the axis and the few, somewhat thickened branches smooth or scaberulous; spikelets solitary, on thickened pedicels, purplish-slate-colored, ovate, loosely 3-4-flowered, 5-6 mm long; glumes ovate, obtuse, the upper triangular-uneven at the summit, ciliate, 1.8-2 mm long, the lower 1.2-1.5 mm long; lemmas broadly obovate, convex, (2.5) 3-3.2 mm long, more or less keeled, rounded-triangular-subobtuse at the summit, uneven, ciliate, glabrous at the base, purple, golden-membranaceous on the margin; palea slightly shorter, light purple, smooth and glabrous on the keels; anthers oblong-elliptical, 1.5-1.8 mm long, yellow. July-August. (Plate XXXVI, Figure 8).

Solonchets sites, mounds, screes, and sands of the alpine zone (3,000-3,600 m). -Centr. Asia: Pam.-Al. and Tyan'-Shan.(east). Endemic. Described from Khodzha-Nazar-Kop-tezek in Pamir. Type in Leningrad.

13. *A. Grossheimiana* V. Krecz. sp. nova in Addenda, p. 760. -*Puccinellia Grossheimiana* V. Krecz. (in manuscr.). -*P. sevangelensis* Grossh., pp. in herb.

Perennial. A grayish-green, rigid plant; culms erect, 30-60 cm tall, leafy up to the middle; leaves stiff, setaceous-involute, gradually acuminate, scabrous; sheaths closely enveloping the culm. Panicle contracted, ultimately open, 5-15 cm long, with divaricate, flexuous secondary branches, smooth throughout, occasionally scaberulous; spikelets lanceolate, 3-4-flowered, dense, 4-5 mm long; glumes acute, ovate, ciliate, the upper 2-2.5 mm long, keeled, the lower 1.2-1.5 mm long; lemmas oblong-obovate, 3-3.5 mm long, keeled, abruptly pointed, convex, dark purple, golden-margined, distinctly nerved, glabrous at the base; palea densely scabrous on the keels toward the summit; anthers oblong, 1.5-2 mm long. June-July. (Plate XXXV, Figure 9).

Borders of rivers and lakes. -Caucasus: South. Transcauc. Endemic. Described from Armenia. Type in Leningrad.

Section 4. *Holmbergia* V. Krecz. -Supple, mostly green plants, with rather broad (up to 2.5-3 mm), flat or subinvolute leaves. Inflorescence loose, open; lemmas obovate, 2-3 mm long, faintly keeled or more or less convex, rounded or obtusely triangular at the summit, ciliate-margined, more or less hairy at the base; paleas setose on the keels; anthers 0.6-0.9 mm long, oblong.

- 478 Series 1. *Virentes* V. Krecz. -Plants green or pale green in all parts. Panicle branches scabrous, flexuose, divaricate or reclinate. Lemmas pubescent at the base; paleas ciliate on the keels.

14. *A. suecica* Holm. in Bot. Not. (1908) 245. -*Puccinellia suecica* Holmb. in Bot. Not. (1916) 254. -*P. retroflexa* var. *suecica* Holmb. apud Lindem. Sv. Fanerogam fl. (1918) 97. -Exs.: HFR No 46, Kneuck. Mo 141; Dörf. No 4987.

Perennial. A green, loose, tufted plant. Culms 10-50 cm tall; leaves flat or subinvolute, to 2.5 mm long, scabrous on the margin. Panicle initially contracted, later open, 15-25 cm long; the lower branches to 10 cm long, branches and main axis scaberulous; spikelets oblong, dense, 5-7-flowered, light green, 5-7 mm long; glumes oblong-ovate, subobtuse, more or less hispid; the upper glume 2-2.5 mm long, the lower glume 1.5-2 mm long; lemmas obovate, more or less keeled, 3-3.5 mm long, triangular-subobtuse at the summit, obscurely nerved, ciliate; anthers oblong, 0.6-0.9 mm long, dark yellow or purple. July. (Plate XXXVI, Figure 10).

Moist coastal places. -Arctic: Arct. Eur.; European part: Kar. -Lap., Dv. -Pech. Gen. Distr.: Fenno-Scandia. Described from Sweden (Scandia, locality Lomma). Type in Stockholm.

15. *A. pulvinata* (Fr.) V. Krecz. sp. nova in Addenda, p. 760. -*Glyceria distant* pulvinata* Fr. Mant. II (1839) 11. -*Puccinellia pulvinata* V. Krecz. (in manuscr.). -*P. retroflexa* var. *pulvinata* Holmb. ex Lindem. Sv. Fanerogam fl. (1918) 97.

Perennial. A bluish-gray plant, forming dense tufts; peripheral culms accumbent and ascending, 10-30 cm tall, central culms erect, 3-10 cm tall; leaves involute, straight, smooth. Panicle not dense, contracted, 5-10 cm long, becoming lax, very scabrous on the axis and branches; spikelets oblong, 4-6-flowered, pale green or light purple, 5-6 mm long; glumes lanceolate, more or less pointed, especially the upper one; the upper glume to 2 mm long, the lower 1-1.2 mm long; lemmas obovate, faintly keeled, 2-2.5 mm long, triangular-subobtuse at the summit, often uneven-margined, ciliate, glabrous at the base, obscurely nerved. Palea ciliate on the keels, at the summit; anthers oblong, 0.5-0.6 mm long, pale yellow. June-July. (Plate XXXVI, Figure 11).

Maritime flats. -Arctic: Arct. Eur.; European part: Kar. -Lap., Dv. -Pech. Gen. Distr.: Fenno-Scandia. Described from southern Sweden, Vatberg. Type in Leningrad.

- 479 16. *A. sibirica* (Holmb.) V. Krecz. comb. nova. -*Puccinellia sibirica* Homb. in Bot. Not. (1927) 206.

Perennial. A green, large, tussocky plant; culms soft, 50-80 cm tall; leaves flat, abundant, scabrous on the upper surface and on the margin, to 3 mm broad. Panicle racemose-contracted, 10-25 mm long, ultimately

diffuse, loose; branches slender, flexuose, scabrous; spikelets loose, oblong, 4-7-flowered, ca. 5 mm long; glumes ovate, more or less rounded-obtuse, ciliate at the summit; the upper glume 1.5-2 mm long, the lower 1-1.2 mm long; lemmas obovate, convex, to 3 mm long, rounded-obtuse at the summit, with distinct nerves, pilose toward the base; palea ciliate on the keels below; anthers oblong, 0.6-0.7 mm long. June-July. (Plate XXXVI, Figure 12).

Meadows. Arctic: Arct. Sib. (lowlands of Yenisei and Ob.). Described from the lowlands of Yenisei, Tolstyi Nos. Type in Lund.

17. *A. kamtschatica* (Holmb.) V. Krecz. comb. nova. - *Puccinellia kamtschatica* Holmb. in Bot. Not. (1927) 208 et in Hult. Fl. Kamtch. I (1927) 142, pp. - *P. kamtschatica* var. *asperula* in Bot. Not. (1927) 209.

Perennial. A green plant, forming loose clumps. Culms 10-30 cm tall, soft; leaves nearly as long as the culm, flat, to 2 mm broad, scabrous on the upper surface and on the margin. Panicle oblong, 5-12 cm long, contracted, ultimately diffuse, loose, the axis and branches scabrous; spikelets oblong, 6-9-flowered, loose, 5-8 mm long; glumes ovate, more or less rounded-obtuse, ciliate, the upper glume 2-2.5 mm long, the lower 1-1.5 mm long; lemmas obovate, convex, 2-2.5 mm long, faintly lobate-subobtuse, ciliate, obscurely nerved, with long hairs at the base, stramineous-margined; palea markedly longer than the lemma, ciliate on the keels down to the base; anthers oblong, 0.7-0.8 mm long, greenish-yellow. June. (Plate XXXVI, Figure 13).

Meadows, river banks and springs. - East. Siberia: Len. - Kol.; Far East: Kamch. Endemic. Described from Kamchatka, Pushino - springs of river Kashkan. Type in Leningrad.

18. *A. choresmica* V. Krecz. sp. nova in Addenda, p. 761. - *Puccinellia choresmica* V. Krecz. (in manuscript.).

Perennial. A light-green, tufted plant; culms ascending and radiating, 10-20 cm tall; leaves involute, to 2 mm broad, shorter than the culms. Panicle somewhat contracted, to 10 cm long, ultimately with horizontal or reclinate, scabrous branches; spikelets oblong-elliptical, 5-8-flowered, 5-7 mm long; glumes subobtuse, ovate, ciliate, the upper glumes 2-2.5 mm long, the lower glume 1.5-1.8 mm long; lemmas obovate, faintly keeled, 2-2.5 mm long, faintly triangular, semi-rounded at the summit, ciliate, obscurely nerved, pilose at base; palea as long as the lemma, minutely ciliate on the keel down to the base; anthers oblong, 0.6-0.8 mm long, light green. May-June. (Plate XXXVI, Figure 14).

480 Solonchets sands, also as weed along irrigation canals. - Centr. Asia: Kyz. - Kum. (Amu-Dar'ya lowlands). Endemic. Described from Mount Krantau. Type in Leningrad.

19. *A. paupercula* (Holm.) V. Krecz. comb. nova. - *Puccinellia paupercula* Fern. et Weath. in Rhod. XVIII (1916) 18. - *Glyceria paupercula* Holm in Fedde's Rep. III (1907) 337.

Perennial. A loosely tufted plant; culms 10-30 cm tall, with numerous old sheaths; leaves abundant, as long as the culms, folded, gradually acuminate, to 2.5 mm broad. Panicle 5-7 cm long, with smooth, angular branches, contracted, the lower branches ultimately spreading; spikelets dense, 3-6-flowered, oblong-elliptical, 5-6 mm long; glumes ovate, subobtuse, the upper glume 2-2.5 mm long, the lower 1-1.5 mm long; lemmas ovate, 2.5 mm long, triangular-obtuse at the summit, uneven-margined,

green or purple, the nerves obscure, scantily hairy at the base; palea scaberulous on the keels toward the summit, glabrescent; anthers 0.5-0.7 mm long. June-July. (Plate XXXVII, Figure 15).

Maritime meadows. -Far East. Kamch., Sakh., Ussur. Gen. Distr.: North America. Described from Mansfield Island in Hudson Bay.

20. *A. alaskana* (Scribn. et Merr.) V. Krecz. comb. nova. -*A. maritima* var. *amphibia* Kom. in Fl. penins. Kamtsch. 1 (1927) 184. -*Puccinellia alaskana* Scribn. in Contr. U.S. Nat. Herb. XIII (1910) 78. -*P. paupercula* Holmb. in Hult. Fl. Kamtsch. 1 (1927) 141 pp.

Perennial. A tufted plant, occasionally stoloniferous; culms ascending, 10-25 cm tall, enveloped by broad sheaths (to 3 mm broad); leaves flat, to 4 mm broad, nearly smooth, as long as the culms. Panicle enclosed in leaf sheaths in lower part, 5-8 cm long, the branches obliquely spreading, ultimately horizontal or reclinate, smooth; spikelets arranged over the whole length of the branch, rather dense, 2-3-flowered, oblong, 4-6 mm long, green; glumes ovate, subacute, keeled, the upper glume 2-5 mm long, the lower 1.5-2 mm long; lemmas ovate, 3 mm long, gradually tapering toward the summit, subobtusely, prominently nerved, scantily hairy at the very base only, green or slightly purplish; palea setose on the nerves only at the summit; anthers oblong, 0.8-1 mm long.

Far East: Kamch.: at the seaside near Petropavlovsk. Gen. Distr.: Alaska. Described from there. Type in Washington.

483 21. *A. tenella* (Lge.) V. Krecz. comb. nova. -*Glyceria tenella* Lge. in Kjellm. et Lundstr. Faner. fl. Nov. Zeml. (1882) 313, tab. 6. -*Puccinellia tenella* V. Krecz. in schedis. -*P. retroflexa* ssp. *borealis* Holmb. in Bot. Not. (1926) 182. -*l.c.*: Ostenf. Fl. arct. I (1902) fig. 95.

Perennial. A grayish-green, loosely tufted plant; culms decumbent, ascending, 5-15 cm tall; the basal leaves falcate, involute, smooth, shorter than the culms. Panicle spiciform-contracted, 2-4 mm long, the smooth branches ultimately somewhat divergent; spikelets oblong, 3-4-flowered, 3-6 mm long; glumes obtuse, ciliate on the margin, the upper broadly ovate, uneven at the summit, obtuse, slightly folded, 1.5-2 mm long (see figure), the lower ovate, to 1 mm long; lemmas obovate, convex (not keeled), 2-2.5 mm long, rounded-obtusely and ciliate at the summit, more or less hairy below, obscurely nerved; palea sparsely ciliate on the keels toward the summit; anthers oblong, 0.7-0.8 mm long. (Plate XXXVII, Figure 16).

Coastal sands and rocks. -American-European type. Arctic: Nov. Zem., Arct. Eur. Gen. Distr.: Eur. and Amer. Arctic Regions. Described from Novaya Zemlya (Rogachev's Bay). Type in Sweden.

Explanation to Plate XXXVI

8. *Atropis pauciflora* (Hack.) V. Krecz. -10. *A. suecica* Holmb. -11. *A. pulvinata* (Fr.) V. Krecz. -12. *A. sibirica* (Holmb.) V. Krecz. -13. *A. kamtschatica* (Holmb.) V. Krecz. -14. *A. choresmica* V. Krecz. -18. *A. distans* (L.) Griseb. -19. *A. glauca* (Rgl.) V. Krecz. -20. *A. Hackeliana* V. Krecz. -21. *A. Hauptiana* (Trin.) V. Krecz. (Hairiness at the base of glumes not represented in the drawing). -22. *A. tiliensis* V. Krecz. -In all figures: a) glumes; b) lemma and palea from the side; c) lemma and palea in front view; d) anthers; e) portion of inflorescence.



Series 2. *Colorantes* V. Krecz. -A purplish-green plant. Panicle branches mostly smooth, straight, spreading, bearing few spikelets. Lemmas glabrescent at the base; palea sparsely ciliate only toward the summit, or glabrous.

22. *A. laeviuscula* V. Krecz. nova in Addenda p. 762. -
Puccinellia laeviuscula V. Krecz. (in manuscr.). -*Glyceria tenella* Ostenf. Fl. arct. I (1902) 129 ex p.

Perennial. A tufted plant; culms 15-20 cm tall, decumbent, furrowed above, smooth below, inflated; leaves nearly as long as the culms, to 2.5 mm broad, folded, bent, abruptly subobtuse; lower sheaths very numerous. Panicle 8-10 cm long, the few branches very remote (3-5 mm apart), smooth, ultimately reclinate branches; spikelets 1-3 at the ends of branches, dense, 3-4-flowered, oblong, 3-4.5 mm long. Glumes ovate, obtuse, keeled, very prominently nerved, the upper to 2 mm long, the lower 1.3-1.5 mm long; lemmas oblong-ovate, 2-2.5 mm long, subcarinate, with thickened, prominent nerves, uneven at the summit, subapiculate, glabrous at the base, greenish-purple; palea somewhat shorter than the lemma, smooth on the keel; anthers oblong, 0.5-0.7 mm long. (Plate XXXVII, Figure 17).

Tundra. -Far East, Chuk.: Gulf of St. Lawrence, Arakam-chechen Island. Described from the Gulf of St. Lawrence. Type in Leningrad.

Section 5. *Euatropis* V. Krecz. -Mostly grayish-green plants. Inflorescence with divaricate, ultimately reclinate branches. Lemmas broadly obovate, straight-truncate or broadly subrounded-truncate at the summit, ciliate on the margin, convex, 1.5-2 (2.3) mm long, glabrous or glabrescent at the base. Anthers 0.4-1 mm long.

484 Series 1. *Isoplepides* V. Krecz. -Lemma and palea of equal length. Anthers 0.8-1 mm long, linear-elliptical.

23. *A. distans* (L.) Griseb. in Ldb. Fl. Ross. IV (1853) 388. -
A. distans Grisebachiana Pacz. Khers. Fl. (Flora of Kherson) I (1914) 213. -*Puccinellia distans* Parl. Fl. It. I (1650) 370, pp. -
Poa distans L. Mant. I (1767) 32. -Exs.: Pl. Finl. exs., No 483; Dörf. No 4988.

Perennial. A coarse, green, sprawling-tufted plant, with shortened parts; culms thickened, geniculate at the base, 15-60 cm tall; leaves flat, subobtuse, to 2-5 mm broad, with broad sheaths. Panicle pyramidal, short branches (to 6 cm in length), with a cluster of reduced branches at their base; spikelets oblong, 3-6-flowered, loose, 4-5 mm long, green or more or less purple; glumes ovate, obtuse, more or less ciliate, the upper 1.5-2 mm long, the lower 1 mm long; lemmas broadly obovate, 2-2.3 mm long, broadly rounded or subtruncate (Plate XXXVI, Figure 18), ciliate on the margin, with a golden fringe, glabrous at base, distinctly nerved; palea as long as the lemma or slightly shorter, with hispid keels; anthers linear-elliptical, 0.8-1 mm long, light orange. June-August.

Wet solonchets sites. -European part: everywhere; Caucasus: Dag., South. Transcauc.; West. Siberia: Upp. Tob. (west. part), Ob. region, Irt. (east. part). Gen. Distr.: Europe. Described from western Europe. Type in London.

24. *A. glauca* (Rgl.) V. Krecz. sp. nova in Addenda p. 762. -*A. distans* var. *glauca* Rgl. in A. H. P. VII, 2 (1881) 623. -*Puccinellia glauca* V. Krecz. (in manusc.).

Perennial. A light-green or bluish-green, sprawling-tufted plant; culms 40-50 cm tall; leaves short, to 2.5 mm broad. Panicle open, 5-20 cm long, with scabrous, long (7-10 cm), ultimately reclinate branches; spikelets oblong-ovate, 4-5-flowered, rather loose, 5-6 cm long, green; glumes ovate, ciliate, prominently nerved, the upper broadly ovate, acute, to 2 mm long, the lower oblong, obtuse, to 1.5 mm long; lemmas obovate, convexly subrotund at the summit (Plate XXXVI, Figure 19), glabrescent at the base, obscurely nerved; palea as long as the lemma, scantily ciliate toward the summit; anthers oblong-elliptical, 0.8 mm long, yellowish or somewhat purplish.

Irrigation ditches; among crops, as a weed. -Centr. Asia: Kyz. -Kum., Amu-Dar., Pam. -Al. (south), Syr-Dar. Endemic. Described from Katta-Kurgan. Type in Leningrad.

25. *A. Hackeliana* V. Krecz. sp. nova in Addenda p. 762. -*A. convoluta* var. *subscariosa* Hack. in Kjoeb. Vidensk. Meddel. (1903) 172. -*A. tenuiflora* Hack. in A. H. P. XXI, 3 (1903) 433, exp., non Griseb. -*A. convoluta* Hack.; id 442, non Griseb. -*Colpodium filifolium* Hack. (fide Litw.) in MSS. -*Puccinellia Hackeliana* V. Krecz. (in manusc.) *P. alticola* Litw. in herb. -Exs.: Herb. Kronenb. 41.

485 Perennial. A stiff, densely tufted, grayish-green plant; culms geniculate at the base, 10-35 cm tall; leaves involute, short, smooth; the basal sheaths numerous, broad, light or dark brown. Panicle oblong, contracted, 5-10 cm long, ultimately open, the axis and branches smooth; spikelets oblong-lanceolate, 3-5-flowered, pointed, purple, 4-5 mm long; glumes ovate, subobtusate, ciliate, the upper 2-2.3 mm long, the lower 1.5-2 mm long; lemmas keelless, (2) 2.5-3 mm long, subtriangular-rounded at the summit, purple, with a very broad scarious margin, ciliate, hairy at base; palea mostly slightly shorter, setose on the keels toward the summit, setose-pilose toward the base; anthers oblong, 0.8-1 mm long. July-August. (Plate XXXVI, Figure 20).

High-mountain desert steppe, stony slopes, screes. -Centr. Asia: Pam. -Al., Tyan'-Shan (south). Endemic. Described from Sassyk-kul' Lake in Pamir. Type in Leningrad.

Series 2. *Anisolepides* V. Krecz. -Palea 1-1.5 mm longer than the lemma. Anthers 0.4-0.6 mm long, elliptical.

26. *A. Hauptiana* (Trin.) V. Krecz. comb. nova Addenda p. 762. -*A. distans* auct. fl. sib. -*A. distans* var. *multiflora* Turcz. in herb. -*Poa Hauptiana* Trin. in herb. -*Puccinellia Hauptiana* V. Krecz. (in manusc.).

Perennial. A slender, light-green or grayish-green, tufted plant; culms 15-60 cm tall, slender; leaves thin, flat or subinvolute, 1-2 mm broad; sheaths narrow. Panicle contracted, ultimately open, 15-20 cm long, with long, slender, scabrous branches, without reduced branchlets at the base. Spikelets elongate, narrow, (5) 6-8-flowered, dense, 4-5 mm long; glumes ovate, rather uneven-margined, the upper 1.2-2.5 mm long, the lower 0.7-1 mm long; lemmas obovate, broadly rounded-obtusate, 1.7-1.8 mm long, uneven-margined and ciliate, green, lighter-colored toward the

summit, obscurely nerved, scantily short-pilose at the base; palea 1.5–2 mm shorter than the lemma, minutely ciliate on the keels; anthers narrowly elliptical, 0.5–0.6 mm long. June–July. (Plate XXXVI, Figure 21).

Wet meadows, marshes. –European part: Lad. –E'm. (Leningrad – introduced), the whole of Siberia and Far East. Endemic. Described from the surroundings of Kurgan. Type in Leningrad.

27. *A. iliensis* V. Krecz. sp. nova in Addenda p. 763. –*Puccinellia iliensis* V. Krecz. (in manuscr.).

Perennial. A light green, compactly tufted plant; culms numerous, radiating, 5–20 cm tall, enveloped by sheaths all the way up; leaves subinvolute, short. Panicle contracted, ultimately open, to 10 cm long, the axis and the slender branches scabrous, 2 of the 3–4 branches of a whorl much shortened; spikelets lanceolate or ovate, 3–5-flowered, green (ultimately rose-colored), 2–3 mm long; glumes rounded-obtuse, ciliate, 466 the upper broadly ovate, uneven-margined, folded, to 1 mm long, the lower ovate, to 0.5 mm long; lemmas broadly obovate, 1.5–1.6 mm long, subrotund at the summit, often uneven, densely ciliate, obscurely nerved, glabrous at the base; lemmas slightly longer, sparsely and minutely ciliate on the keels in upper part; anthers elliptical, 0.5 mm long. (Plate XXXVI, Figure 22).

Sands, sandy meadows in the Ilysa river basin, near the source of Bakanas. Type in Leningrad.

Series 15. *Brachyantherae* V. Krecz. –Anthers broadly linear, 0.4–0.5 mm long.

28. *A. sevagensis* (Grossh.) V. Krecz. comb. nova in Addenda, p. 763. –*Puccinellia sevagensis* Grossh. in Fl. Kavk. (Flora of the Caucasus) I (1928) 114.

Perennial. A large, light, green, noncespitose plant; culms erect, 60–80 cm tall; leaves subinvolute or practically flat, to 3–3.5 mm broad, scabrous on the upper surface. Panicle initially flabelliform, 20–30 (40) cm long, the scabrous branches to 10–15 cm long, ultimately reclinate, spreading; spikelets at the ends of branches, oblong, 2–5-flowered, loose, 4–5 mm long, initially green, later dark purple; glumes ovate, with glabrous, uneven margins, the upper subacute, 1.5–1.8 mm long, the lower to 1 mm long; lemmas broadly obovate, 2–2.3 mm long, rounded-obtuse at the summit, golden-fringed, ciliate on the margin, obscurely nerved, glabrous at the base; palea ciliolate on the keels; anthers broadly linear, short, 0.4–0.5 mm long. June–July. (Plate XXXVII, Figure 23).

Wet places. –Caucasus: South. Transcauc. Endemic. Described from Sevag Island on Gokcha. Type in Tiflis.

NOTE. Forming hybrids with *A. Grossheimiana* V. Krecz. (page 477).

Section 6. *Xeratropis* V. Krecz. –Grayish-green, mostly stiff plants, with involute leaves. Inflorescence with appressed, ultimately spreading branches. Lemmas oblong-obovate, mostly triangular-pointed or faintly triangular-rounded at the summit, obscurely keeled mostly toward the summit, 2–3.5 mm long, hairy at the base. Anthers 1.2–1.5 (2) mm long.

Series 1. *Pseudo-festuciformes* V. Krecz. –Very large (up to 100 cm tall), loosely tufted plants, with subinvolute leaves to 5–6 mm broad.

Lemmas 2-2.5 mm long, obscurely keeled, faintly triangular or trilobed-rounded at the summit. Anthers 1.3-1.6 mm long.

29. *A. gigantea* Grossh. in *Monit. Jard. Bot. Tiflis*, 46-47 (1913) 35, tab. II. - *A. festucaeformis* auct. fl. Cauc., non Boiss. - *Puccinellia gigantea* Grossh. in *Fl. Kavk. (Flora of the Caucasus)* I (1928) 114. - *P. palustris* Grossh. in *Fl. Kavk. (1928)* 115.

- 487 Perennial. A large, bluish, loosely tufted plant; culms 50-100 cm tall, smooth, or scabrous below the inflorescence; leaves flat or subinvolute, to 4-5 mm broad, scabrous on the upper surface, elongate and strongly pointed; sheaths loose, purplish-red below. Panicle elongate, erect or somewhat drooping at the top, 20-30 cm long, initially contracted, the branches later spreading at an angle; branches scabrous, 2-3 of them up to 10-12 cm long, the others (5-6) shortened, in fascicles at their base; spikelets narrowly lanceolate, 3-7-flowered, dense, greenish; glumes oblong-ovate, obtuse, ciliolate on the margin, the upper 2-2.5 mm long, the lower 1.5-2 mm long; lemmas obovate, 2-2.5 (3) mm long, obscurely keeled, triangular-rounded at the summit, with an obtuse, projecting central lobe, more or less pilose on the nerves below, green or brownish, broadly stramineous-golden on the margin; palea mostly shorter, sparsely ciliate on the keels toward the summit; anthers oblong, 1.2-1.5 mm long. (Plate XXXVII, Figure 24).

Solonets meadows. -Caucasus: East, Transcauc. Tal.; Centr. Asia: Kara-Kum. Endemic. Described from Kumbasha below Lenkoran'ya. Type in Tiflis.

30. *A. chilochloa* V. Krecz. sp. nova in *Addenda* p. 764. - *Puccinellia chilochloa* V. Krecz. (in manuscr.).

Perennial. Differs from the preceding species in bluish green coloration, and a larger, dense panicle; forming dense, compact tufts. Leaves short, strongly attenuate to a subacute hood. Lemmas 2.5-3 mm long. Otherwise resembling the preceding species.

Close to water and submerged. -European part: Low. Volg.; Centr. Asia: Aral. -Casp., Kyz-Kum. (north). Endemic. Described from Kara-uzyak (near Kyzl'-Orda), close to Bidai-kul'. Type in Leningrad.

31. *A. anisoclada* V. Krecz. sp. nova in *Addenda* p. 764. - *A. distans* f. *robusta* Roshev. in *A. H. P. XXXVIII* (1924) 124. - *Puccinellia anisoclada* V. Krecz. (in manuscr.).

Perennial. A grayish-green, bushy, loosely tufted plant; culms 50-100 cm tall, more or less narrowed upward, smooth or scabrous below the inflorescence; leaves subinvolute or flat, 2.5-3 mm broad, acute, elongate, scabrous on the upper surface; panicle initially contracted, later spreading, diffuse, 10-20 cm long; branches unequal, 1-2 longer, with a fascicle or shortened branches at the base, slender, scabrous; spikelets linear, 4-8-flowered, dense, 5-8 mm long; glumes obtuse, ciliate, ovate, the upper 2-2.5 mm long, the lower to 1.5 mm long; lemmas broadly obovate, 2-2.5 mm long, obscurely keeled, broadly enveloping the palea, rounded-triangular at the summit, ciliate, green, broadly purplish-brown toward the summit, obscurely nerved, scantily hairy at the base; palea narrower and shorter than the lemma, ciliate on the keels toward the summit; anthers to 1.5 mm long. (Plate XXXVIII, Figure 26).

Solonets hollows in the foothills, and fields. -Centr. Asia: Upp. Turkm. (east), Amu-Dar., Kyz-Kum., Syr-Dar., Pam.-Al., Tyan'-Shan (west).

Pribalkh. (south). Endemic. Described from Lalemkán in Kugitanga. Type in Leningrad.

- 488 Series 2. *Convolutae* V. Krecz. - Low-growing tufted plants, with short, convolute leaves (not exceeding 2 mm in width). Lemmas 2-3 mm long, oblong, mostly triangular-pointed or with a point projecting beyond a rounded summit. Anthers 1.2-2 mm long.

32. *A. convoluta* (Kunth) Griseb. in Ldb. Fl. Ross. IV (1853) 389. - *Festuca convoluta* Kunth En. pl. I (1839) 393.

A dubious species, differing from the next one in smaller glumes, lemma and palea: the upper glume 1.8-2 mm long, the lower 1.2-1.3 mm. Lemmas 2-2.5 mm long, triangular at the summit, slightly keeled. Palea glabrous on the keels. Anthers 1-1.3 mm long.

Solonchets soils. - European part: Prichern., Low. Don. Described from garden-grown plants from Copenhagen.

33. *A. dolicholepis* V. Krecz., sp. nova in Addenda p. 764. - *A. convoluta* auct. pro max. parte. - *Puccinellia dolicholepis* V. Krecz. (manuscr.).

Perennial. A grayish-green plant, more or less tufted; culms slender (to 2-1.2 mm in diameter), mostly geniculate, 30-60 cm tall, enveloped at the base by compact tawny-brown sheaths; leaves setaceous-convolute, smooth (to 1.2-1.5 mm broad when unrolled). Panicle relatively loose, 10-15 cm long, initially contracted, later open, the axis and the slender branches scabrous; spikelets linear or linear-lanceolate, 3-5-flowered, light-purple, 5-7 mm long; glumes oblong-ovate, the upper more or less acute, 2-2.5 mm long, the lower subacute, 1-1.3 mm long. Lemmas oblong-ovate, 3-3.5 (4) mm long, attenuate-subacute at the summit, with a keel-like prominent mid-nerve and distinct marginal nerves, violet-purple, hairy at the base; palea shorter, scabrous on the keels toward the summit, hairy below; anthers oblong, 2 mm long, orange-yellow. June-July. (Plate XXXVIII, Figure 27).

Solonchets sites in fescue-wormwood and desert-wormwood steppes. - European part: Prichern., Low. Don., Low. Volg., Zavolzh. (south); Caucasus: Dag., East. Transcauc.; West. Siberia: Upp. Tob. (south), Ob. (south), Irt. (south); Centr. Asia: Aral. - Casp., Pribalkh. Endemic. Described from Nura River basin, Romashovskoe village, Akmolinskii Raion. Type in Leningrad.

NOTE. This species represents the basic constituent of the old species *Atropis convoluta* Griseb. and it is heterogeneous over the distribution area indicated. In the western parts of Prichern. and low. Don the glumes and anthers are smaller and the palea is glabrous at the base. The Caucasian plants also differ slightly. Lack of material precludes a more complete elucidation of these forms.

34. *A. sclerodes* V. Krecz. sp. nova in Addenda p. 765. - *A. distans* var. *crassifolia* Roshev. in A. H. P. XXXVIII (1924) 121. - *Puccinellia sclerodes* V. Krecz. (in manuscr.).

- 489 Perennial. A grayish-green, rather densely tufted, stiff plant; culms 30-60 cm tall, somewhat thickened (up to 2-2.3 mm), smooth, or scabrous near the inflorescence, enveloped to a considerable height by free sheaths which are light brown below, very loose and broad; leaves short, stiff, straight, convolute, to 3-3.5 mm broad, scabrous on the margin and on the inside, strongly acuminate. Panicle oblong, contracted, 5-15 cm long.

the branches ultimately spreading, more or less horizontally; spikelets narrowly linear, shining, subterete, 4-7-flowered, dense, brownish, 5-7 mm long, usually arranged in twos; glumes oblong-ovate, rounded-obtuse, ciliate, the upper 2 mm long, the lower 1.5 mm long; lemma ob-ovate, 2-2.5 mm long, cylindrical, involute, clasping the palea, obtusely triangular at the summit, faintly ciliate, with fairly distinct nerves, markedly keeled toward the summit, hairy toward the base, rusty-purple; palea shorter and narrower, setulose on the keels; anthers oblong, 1.5-1.6 mm long.

Solonets sites of the desert-steppe and steppe zone. -European part: Low. Don., Low. Volg.; Centr. Asia: Aral. -Casp., Kyz-Kum., Syr-Dar., Pribalkh. Endemic. Described from Tagusken village on the river Sary-su in Akmolinskii Raion. Type in Leningrad.

35. *A. macropus* V. Krecz. sp. nova in Addenda, p. 765. -*Puccinellia macropus* V. Krecz. (in manuscr.).

Perennial. A grayish-green, stiff plant, the numerous culms densely enveloped at the base, and up to a considerable height, by old, somewhat shining, fibrous-membranaceous sheaths, thus forming large, compact tufts; culms mostly erect, 40-50 cm tall; leaves stiff, erect, more or less attenuate toward the base, convolute or subconvolute (1.9-2 mm broad when unfolded). Panicle short, 3-10 cm long, contracted, the branches slender, scabrous, short, appressed, with alternately arranged narrow spikelets; spikelets linear-lanceolate, 2-3-flowered, stramineous, 2-5 mm long; glumes lanceolate, subacute, the upper 2 mm long, the lower 1 mm long; lemmas oblong-ovate, 2-2.5 mm long, triangular-pointed at the summit, broadly scarious-margined, obscurely nerved, glabrous at the base; palea shorter than the lemma, minutely prickly on the keels down to the base; anthers oblong, 1.2-1.5 mm long, sulfur-yellow. June. (Plate XXXVIII, Figure 29).

Solonets sands. -Centr. Asia: Pribalkh. (east). Endemic. Described from Takyr-Izgar, in the lower reaches of the river Karatal. Type in Leningrad.

Series 3. *Perteues* V. Krecz. -Panicle branches very slender, capillary. Lemmas and paleas rounded at the summit, convex on the back, 2 mm long. Anthers to 1.5 mm long, narrowly linear.

36. *A. tenuissima* (Litw.) V. Krecz. comb. nova. -*A. tenuiflora* Korsh. in Tent. Fl. Ross. or. (1898) 481, non Griseb. -*A. convoluta* auct. pp. -*Puccinellia tenuissima* Litw. in Addenda p. 765. -*P. Korshinskyana* V. Krecz. in herb.

490 Perennial. A grayish-green, very slender, stiff plant, forming small tufts; culms erect, slender (to 0.5 mm in diameter), 20-50 cm tall; leaves filiform, convolute, short, rather smooth; basal sheaths tightly enveloping the culm. Panicle loose, rather few-flowered, contracted, 5-15 cm long, the branches slender, smooth or nearly so, ultimately subdivaricate; spikelets elliptical, 3-5-flowered, 3-4 mm long; glumes obtuse, glabrous on the margin, convex, ovate, not keeled, 1.5-1.7 mm and 0.7-1 mm long respectively; lemmas oblong-ovate, convex, 2 mm long, rounded-obtuse, ciliate at the summit, obscurely nerved, more or less hairy below, mostly purple all over; palea slightly shorter, ciliate on the keels toward the summit; anthers narrow, linear, 1.2-1.5 mm long, yellow. May-June. (Plate XXXVIII, Figure 32).

Steppe and coastal (dark-colored) solonchaks sites, in the zone of feather grass and feather grass-mixed-grass steppes. -European part: Zavolzh., Volg.-Kam. (south); West. Siberia: Upp. Tob., Ob. Alt. (west), Irt.: Centr. Asia: Aral.-Casp. (north), Pribalkh. (north). -Described from Khudaikul' Lake. Pavlodarskii Raion. Type in Leningrad.

37. *A. diffusa* V. Krecz. sp. nova in Addenda p. 765. -*Puccinellia diffusa* V. Krecz. (in manuscr.).

Perennial. A grayish-green plant; culms 30-60 cm tall, slender, thickened and densely enveloped by old sheaths at the base; leaves short, linear, 0.8-1.3 mm broad, flat or subconvolute, scabrous. Panicle diffuse, 10-20 cm long, with a smooth axis; branches capillary, long, scabrous only at the ends near the spikelets; spikelets solitary, not crowded, linear-lanceolate, dense, 4-8-flowered, 5-6 mm long, silvery-purple; glumes rounded-obtuse, the upper elliptical-ovate, 2 mm long, the lower ovate, 1.2 mm long; lemmas obovate, 2-2.3 (2.5) mm long, subrotund or obtusely and broadly triangular, ciliate at the summit, short-pilose at the base, purple, stramineous-margined; palea minutely ciliate on the keels toward the summit, pilose below; anthers oblong, to 1.5 mm long. (Plate XXXVIII, Figure 31).

Centr. Asia: Pribalkh. (south and west), Tyan'-Shan (west and north), Syr-Dar. (west). Endemic. Described from Ak-Tugai, by the river Ilya. Type in Leningrad.

Series 4. *Bulbosae* V. Krecz. -Culms slender, thickened at the base; panicle branches usually smooth. Lemmas 1.8-2 mm long, rounded at the summit, apiculate.

38. *A. bulbosa* Grossh. in Monit. Jard. Bot. Tiflis, 46-47 (1919) 36, tab. II. -*Puccinellia bulbosa* Grossh. in Fl. Kavk. (Flora of the Caucasus) I (1928) 114. -Exs.: Grossh. et Schischk. No 26.

Perennial. A grayish-purple-green plant; culms 20-40 cm tall, bulbous at the base; leaves subinvolute, to 2 mm broad, abruptly acuminate; lower sheaths broad. Panicle oblong, 5-15 cm long, the branches smooth or nearly so (in Azerbaijan rather scabrous), appressed, ultimately spreading; spikelets lanceolate, 4-6-flowered, on more or less scabrous pedicels, 4-6 mm long, mostly purple; glumes ovate, the upper subacute and ciliate, 1.5-2 mm long, the lower glume subobtuse, oblong, 1-1.5 mm long; lemmas broadly obovate, 1.8-2 (2.2) mm long, truncate or subrotund at the summit, with a blunt point projecting from the middle, uneven-margined, purple, ciliate, golden-margined, the nerves obscure, the outer ones distant, all pilose below; palea short-ciliate on the keels toward the summit; anthers oblong, 1-1.2 mm long. (Plate XXXVIII, Figure 25).

Explanation to Plate XXXVII

15. *Atropis paupercula* (Holm) V. Krecz. (only "a", "b", and "c" refer to *A. kamtschatica* V. Krecz.). -16. *A. tenella* (Lge) V. Krecz. f.) branch with shed spikelets. -17. *A. laeviuscula* V. Krecz. f.) branch with shed spikelets. -23. *A. sevangelensis* (Grossh.) V. Krecz. -24. *A. gigaspora* Grossh. -25. *A. bulbosa* Grossh. -In all figures: a) glumes; b) lemma and palea from the side; c) lemma and palea in frontal view; d) anthers; e) portion of inflorescence.

PLATE XXXVII



Solonets sites in steppes. -European part: Low, Volg. (south)?; Caucasus: East. and South. Transcauc., Dag. Endemic. Described from Mount Makhata near Tiflis. Type in Tiflis.

39. *A. Roshevitsiana* Schischk. in Animadv. Herb. Un. Tomsk. No 3 (1929) 1. -*Puccinellia Roshevitsiana* V. Krecz. comb. n. (mscr.).

Perennial. A large, stiff, grayish-green plant; culms 30-80 cm tall; leaves canaliculate-involute, 2-4 mm broad, bristly-scabrous at the summit and on the margin, straight, gradually acuminate; basal sheaths reddish- or light-brown, broad. Panicle elongate, narrow, 10-15 cm long, the branches spreading after flowering, short (3-5 cm), with subsessile clusters of spikelets at their base, rather smooth below, setose-spinescent toward the end and near the spikelets; spikelets linear-lanceolate, 4-7-flowered, dense, green, 5-8 mm long. Glumes obtuse, keeled, scabrous on the keel at the summit, ciliate, the upper ca. 3 mm, the lower 1.5-2 mm long; lemmas obovate, convex or faintly keeled, 3-3.5 mm long, hairy at the base, scarious toward the summit; palea ciliate on the keels toward the summit. Anthers 1-1.2 mm long, light yellow. June-July.

Solonets sites. -Centr. Asia: Pribalkh. Gen. Distr.: East. Mongol. Described from the river Black Irtysh in Mongolia. Type in Tomsk.

Series 5. *Tenellae* V. Krecz. (incerte sedis). -Spikelets small, 2-4-flowered. Glumes obovate or ovate, rounded at the summit, the upper 1 mm long, the lower to 0.5 mm long. Lemma and palea 1.5-1.6 mm long, broadly rounded at the summit. Anthers 0.9-1 mm long.

40. *A. tenuiflora* (Turcz.) Griseb. in Ldb. Fl. Ross. IV (1853) 389. -*Atropis distans* var. *tenuiflora* Turcz. in herb. -*Puccinellia tenuiflora* V. Krecz. comb. n. (mscr.).

Perennial. A grayish-green plant, forming tufted clumps; culms 40-70 cm tall, very slender toward the top; leaves to 3 mm broad, usually setaceous-involute or subinvolute. Panicle with a slender, smooth axis, 10-20 cm long, initially contracted, ultimately with spreading, scaberulous, capillary branches; spikelets small, up to 3 mm long, 2-4-flowered, usually dark purple; glumes ovate, rounded-obtuse, the upper 1-1.3 mm long, the lower 0.4-0.5 mm long; lemmas obovate, 1.5-1.6 mm long, broadly subtriangular-rounded at the summit, uneven-margined, ciliate, obscurely nerved, glabrous at the base; palea glabrous on the keels, with few bristles only at the summit; anthers linear, 0.9-1.1 mm long, orange-colored. June-July. (Plate XXXVIII, Figure 33).

494 Solonets meadows. -West. Siberia: Alt.; East. Siberia: Ang. -Sayan., Daur., Len. -Kol. (south); Centr. Asia: Pribalkh. (east), Dzung. -Tarb. Endemic. Described from the surroundings of the mineral spring Pogromets in Zabalkal'e. Type in Leningrad.

NOTE. Forms hybrids with *A. macranthera* V. Krecz.

Genus 178. LEUCOPOA* GRISEB. **

Griseb. in Ldb. Fl. Ross. IV (1853) 383. -*Festuca* L. ex parte.

Imperfectly dioecious plants: in some plants the stamens are abortive.

* From Greek leucos - white, and poa - bluegrass.

** Compiled by V.I. Krichetovich and E.G. Bobrov.

in others the stigmas and ovaries. Glumes semi-transparent-membranaceous, light-colored, glabrous, keeled, with a thickened mid-nerve and obscure lateral nerves, the upper glume ovate, usually subobtusae or irregular, the lower lanceolate, subacute. Lemmas membranaceous, rounded-keeled, tapering to a more or less hooded apex, punctate-pilose over the entire surface, oblong-ovate, subacute, with a pronounced mid-nerve, among the remaining 4 nerves the marginal ones usually more developed, all the nerves hispid; palea with thickened nerves hispidulous all the way down; both lemma and palea entire, emarginate, or irregularly serrate at the tip. Anthers oblong, to 4-5 mm long.

1. Inflorescence 3-7 cm long, congested, with few spikelets (10-20), weakly branching or subspiciform 2.
- + Inflorescence large, 10-20 cm long, contracted or open, with numerous spikelets (30-100) 3.
2. The basal sheaths closely investing the culm, brown; anthers yellow; spikelets mostly silvery-purple 1. *L. albida* (Turcz.) V. Krecz. et Bobr.
- + The basal sheaths loose, open, lustrous, honey-colored; anthers purple; spikelets silvery, green or pinkish 2. *L. Olga* (Rgl.) V. Krecz. et Bobr.
3. Inflorescence open, the lower branches 10-20 cm long; spikelets large (10-15 mm); glumes 8-10 mm long 5. *L. sclerophylla* (Boiss. et Hohen.) V. Krecz. et Bobr.
- + Inflorescence contracted, the lower branches 3-5 cm long; spikelets to 10 mm long; lemmas 3-7 mm long 4.
- 495 4. Lemmas ovate, subobtusae, greenish-brown, with a brownish margin and prominent nerves, 5 mm long; upper glume obtuse; anthers 3-3.5 mm long... 4. *L. karatavica* (Bge.) V. Krecz. et Bobr.
- + Lemmas lanceolate, acute, light green, 7 mm long; upper glume acute; anthers to 6 mm long 3. *L. caucasica* (Hack.) V. Krecz. et Bobr.

1. *L. albida* (Turcz.) V. Krecz. et Bobr. comb. nova. - *L. sibirica* Griseb. in Ldb. Fl. Ross. IV (1853) 383. - *Poa albida* Turcz. in Bull. Soc. Nat. Mosc. XI (1838) 105; Turcz. ex Trin. in Mem. Ac. Sc. Petersb., ser. 6, 1 (1831) 387. - *Koeleria sibirica* Rudolph in herb. Ldb., l. c. - *Festuca sibirica* Hack. in Boiss. Fl. Or. V (1884) 626.

Perennial. Forming dense, pulvinate tufts; culms 40-80 cm tall, erect, tightly enveloped at the base by brown or light brown, subfibrillose old sheaths; leaves grayish-green, stiff, hispid, canaliculate, to 1-2 mm broad, filiform toward the apex, ribbed below on the outside, ciliate-hispid at the base, devoid of ligule or obscurely velutinous, with a shaft-like bulge at the base. Inflorescence oblong, congested, often subspiciform, 3-7 cm long; spikelets obovate, 6-10 mm long, dense, 3-6-flowered, silvery-whitish or silvery-purple; glumes semi-transparent, membranaceous, smooth, subcarinate, the upper glume with a distinct mid-nerve and 2 short, obscure lateral nerves, oblong-ovate, obtuse or irregularly emarginate, 4-6 mm long, the lower glume lanceolate, subacute or irregular, 1-nerved; lemmas oblong-ovate, irregularly serrate at the apex, almost keelless, subacute, with a fairly distinct, scabrous mid-rib and 2



marginal nerves (intermediate nerves obscure), 6-7 mm long, membranaceous, puberulent; palea oblong, scaberulous on the keels toward the summit, bidentate at the summit; anthers oblong, ca. 4 mm long. July. (Plate XXXIX, Figure 1, a-f).

Dry, gravelly and stony slopes, rarely sands, -East. Siberia: Ang. - Sayan., Daur. Gen. Distr.: Mongolia. Described from Siberia (Sayany). Type in Leningrad.

NOTE. It apparently forms a distinct race in Sayany.

2. *L. Olgae* (Rgl.) V. Krecz. et Bobr. comb. nova. - *Molinia Olgaë* Rgl. in A. H. P. VII, 2 (1881) 625. - *Leucopoa sibirica* Kersh. in Mém. Acad. Sc. Pétersb., ser. 6, III (1896) 100, non Griseb. - *Festuca sibirica* B. Fedtsch. in A. H. P. XXXVIII, 1 (1924) 126, non Hack. - Exs.: Herb. Kronenburg. No 45 (sub nom. *Festuca sibirica* Hack. det.).

Perennial. Rather densely tufted; culms 20-50 cm tall, loosely enveloped at the base by broad, smooth, lustrous, honey-colored remnants of old sheaths; leaves grayish-green, flat, to 3-4 mm broad, or subinvolute, subabruptly pointed, more or less ribbed, scabrous on the margin, smooth or setulose at the base; ligule lacking or short-velutinous, lacerate. In-
496 florescence a panicle, contracted (in pistillate specimens), or rather open, 3-6 cm long, with scabrous branches; spikelets obovate, spreading, 8-10 mm long, silvery-white or variegated, pink- or purple-tinged; rachilla scabrous; glumes membranaceous, smooth, keeled, unequal, subacute, the upper 4-5 mm long, ovate-lanceolate, with 1 prominent or 2 obscure nerves, the lower lanceolate, shorter, with 1 distinct nerve; lemmas ovate-lanceolate, subacute, minutely pilose all over the surface, rather convex, with a prominent mid-nerve reaching the summit and 4 less pronounced, scabrous, lateral nerves, 5-8 mm long; palea more or less entire at the tip. Anthers purple, 3-4 mm long. July. (pistillate specimens flowering earlier).

Gravelly and stony slopes of the alpine zone. - Centr. Asia: Tien Shan, Pam. - Al. Gen. Distr.: Afghanistan, Kashmir. Described from Alai (Daraut-Kurgan). Type in Tashkent.

NOTE. In western Pamiro-Alai, Shugnan, and north Tien Shan, apparently forming distinct races.

3. *L. caucasica* (Hack.) V. Krecz. et Bobr. comb. nova. - *Festuca caucasica* Hack. in Boiss. Fl. Or. V (1884) 626; Grossg. Fl. Kavk. I, 119. - *F. sibirica* var. *caucasica* Hack. in Boiss. l. c.

Perennial. A tufted plant, the culms and basal sheaths as in the preceding species; leaves rather flat, with a distinct short ligule; panicle looser and more elongate, oblong, 7-12 cm long; spikelets whitish-green, 4-6-flowered, elliptical, 7-10 mm long; glumes acute, keeled, scabrous toward the summit, the upper ovate, with 1 prominent and 2 obscure nerves,

Explanation to Plate XXXVIII

26. *Atropis anisoclada* V. Krecz. - 27. *A. dolicholepis* V. Krecz. - 29. *A. macropus* V. Krecz. - 30. *A. convoluta* (Kunth.) Griseb. - 31. *A. diffusa* V. Krecz. - 32. *A. tenuissima* (Litw.) V. Krecz. - 33. *A. tenuiflora* (Turcz.) Griseb. - 34. *A. jenziseiensis* Roshev. In all figures: a) glumes; b) lemma and palea from the side; c) lemma and palea in front view; d) anthers; e) portion of inflorescence.

6-7 mm long, the lower lanceolate, 5-6 mm long; lemmas to 8 mm long, oblong-ovate or lanceolate, subcarinate, with distinct thickened nerves, puberulent, subacute, setose-scabrous; palea oblong, entire at the tip. Anthers to 6 mm long. Flowering in the early part of summer.

Subalpine meadows and moraines. -Caucasus: Ciscauc. (Osetiya), south. Transcauc. Endemic. Described from Osetiya: Lars.

4. *L. karatavica* (Bge.) V. Krecz. et Bobr. comb. nova. -*Poa karatavica* Bge. in Mem. Sav. Etr. Petersb. VII (1851) 525. -*Festuca karatavica* B. Fedtsch. in Bull. Jard. Bot. Pétersb. XVI, Suppl. 2 (1915) 86. -*F. Kronenburgii* Hack. in Allg. bot. Zeitschr. (1905) 122. -*F. turkestanica* Franchet in Ann. de Sc. natur. XVII (1884) 273. -*F. subspicata* Lipsky in A. H. P. XVI (1909) 610. -*Glyceria subspicata* Rgl. in A. H. P. VII, 2 (1881) 624.

Perennial. A robust, densely tufted plant; culms 50-100 cm tall, smooth, tightly enveloped at the base by reddish-brown or brown, smooth, sometimes lustrous, scaly sheaths; leaves flat, bluish-green, 3-5 mm broad, 497 ligule truncate, toothed, to 2 mm long. Inflorescence an oblong, congested, erect panicle, to 12 cm long, the axis and branches smooth; spikelets ovate, 3-5-flowered, 7-8 mm long, yellowish-green, rachilla glabrous; glumes convex, keeled, smooth, the upper ovate, subobtusate, with a pronounced mid-nerve and 2 lateral nerves, 4-4.5 mm long, the lower lanceolate, subacute, with a pronounced nerve, to 4 mm long; lemmas elliptical or ovate, convex, faintly keeled, punctate-scabrous-pubescent, attenuate-subacute, 5-6 mm long, distinctly 5-nerved, glaucous-green, the margin and nerves yellowish; palea elliptical, emarginate, scabrous on the nerves all the way down; anthers oblong, 3-3.5 mm long; caryopsis obovate. June-July. (Plate XXXIX, Figure 2, a-f).

Rivulet valleys and juniper groves. -Centr. Asia: Pam. -Al. (west) and Tien Shan (west). Described from Karatau Range. Type in Paris.

5. *L. sclerophylla* (Boiss. et Hohen.) V. Krecz. et Bobr. comb. nova. -*Festuca sclerophylla* Boiss. et Hohen. in Kotschy, Fl. Pers. bor. (1846); Boiss. Diagn. ser. I, XIII (1853) 59. -*F. spectabilis* var. *sclerophylla* Boiss. Fl. Or. V (1884) 625. -Exs.: Fl. cauc. exs., No 76.

Perennial. Forming loose, large tufts; culms 80-200 cm tall, smooth; leaves subinvolute, to 5 mm broad, stiff, scabrous only on the margin; ligule to 2-3 mm long; the lower sheaths fibrous, pinkish-brown. Panicle loose, open, 30-60 cm long, the branches ultimately horizontal or reclinate, scabrous; spikelets whitish or yellowish, 10-15 mm long, oblong-obovate, 3-7-flowered; glumes membranaceous, acute, convex, distinctly nerved, the upper ovate, attenuate toward the summit, 7-8 mm long, the lower lanceolate, 6-7 mm long; lemmas membranaceous, with distinct, scabrous nerves, puberulent, carinate-convex, aristate-subacute, 8-10 mm long, the margin suberose above; palea with keels scaberulous throughout, each excurrent in a spine, arose between the spines, as long as the lemma; anthers to 5 mm long. June-July. (Plate XXXIX, Figure 3, a-f).

Stony mounds. -Caucasus: Ciscauc., Dag., south, and east. Transcauc. Gen. Distr.: northern Persia, eastern Turkey. Described from northern Persia. Type in Geneva.

Genus 179. FESTUCA* L. S. str.

L. Gen. plant. ed. 1 (1737) 41; Sp. pl. ed. 1 (1753) 73.

Spikelets pediceled, disposed in a panicle, loose, with a subflexuous rachilla; glumes unequal, mostly keeled, the lower shorter and narrower, 1-nerved, the upper 3-nerved. Lemmas more or less lanceolate, 5-nerved, acute, awnless or with a rather scabrous awn. Palea lanceolate, more or less bidentate, with 2 scabrous or ciliate keels. Lodicules unequal, bilobed. Stamens 3. Ovary obovate, glabrous or rather hairy at the top, the 2 plumose stigmas 2-3 times as long as the ovary. Caryopsis oblong, convex on the back, grooved at the front, fused to floral bracts or free.

- 498 NOTE. The present arrangement is an attempt to present the genus *Festuca* L., while bypassing the customary procedure of determining the extent of closure of the leaf sheaths, since the observations made by Saint-Ives and Camus on cultivated plants have shown that this character-considered by Hackel to be of fundamental significance - is unreliable and inadequate, and is conditioned by purely fortuitous circumstances. Both identification keys and organization of the material are based on the position of the shoots in relation to the lower sheaths, leaf shape, and dimensions of the parts of the spikelet. If, in certain instances, we had to resort to the character of sheaths closure (in citation from other authors), this was only due to the lack or incompleteness of herbarium material. The elimination of this character forced us, among other things, to refrain from differentiation between *F. valesiaca* and *F. sulcata*. We have also considered it desirable to replace Hackel's sections by subgenera, on the assumption that, following a further monographic study, it may be possible to separate some of them - such as *Schedonorus* P. B., *Drymonaetes* Ehrh., and *Drymanthele* V. Krecz. et Bobr. - into distinct genera, according to the structure of their underground parts, caryopsis, and spikelet.

Key to Subgenera

1. Leaf blades of sterile shoots flat, 7-15 mm broad; large plants of shady forests 2.
- + Leaf blades of sterile shoots setaceous, folded or, if flat, 3-5 (6) mm broad (also, in the latter case, spikelets compressed, with imbricate lemmas, awnless or faintly awned); plants of steppes and meadows, rarely forests 3.
2. Falcate auricles clasping the culm; spikelets compact, long-awned (awn not shorter than its lemma); culms with leaf-bearing sheaths at the base. Subgenus 5. *Drymonaetes* (Ehrh.) V. Krecz. et Bobr.
- + Falcate auricles absent; spikelets spreading, awnless or obscurely awned; culms bases and offshoots with scaly, leafless sheaths Subgenus 4. *Drymanthele* V. Krecz. et Bobr.

* A plant name used by Pliny. Compiled by V. I. Krechetovich and E. G. Bobrov.

3. Spikelets compact, with imbricate lemmas, awnless or faintly awned; lemmas 6-9 mm long, broadly lanceolate. Leaves flat, to 3-5 (6) mm broad. Plants with extravaginal shoots Subgenus 3. *Schedonorus* (P. B.) Asch. et Gr.
- + Spikelets spreading, rather loosely-flowered, usually more or less awned; lemmas 3-6 (9) mm long, lanceolate. Leaves setaceous-involute, 0.8-3 mm broad 4.
- 499 4. Inflorescence rather contracted, with short, scabrous branches. Lemmas keelless, rather long-awned; lodicules bifid; caryopsis firmly fused to the lemma and palea Subgenus 1. *Eufestuca* Griseb.
- + Inflorescence open, with rather smooth branches. Lemmas keeled, awnless or obscurely awned; lodicules faintly emarginate Subgenus 2. *Phaeochloa* Griseb.

Subgenus 1. *EUFESTUCA* Griseb. Spicil. Fl. Rum. II (1844) 432. - Plants with extravaginal (Plate XL, Figure 2), intravaginal (Plate XL, Figure 1), or mixed shoots. Leaves folded or flat, 2-3 mm broad, or else setaceous-involute, ca. 1 mm in diameter; panicle contracted, oblong, with short, scabrous branches. Spikelets green or purple. Lemmas lanceolate, mostly keelless, rather long-awned; lodicules bifid. Ovary usually glabrous. Caryopsis oblong, rather strongly fused to lemma and palea.

1. Lemmas awnless 2.
- + Lemmas awned; awn more than 2 mm long 5.
2. Lemmas 3.5-5 mm long. Anthers 3 mm long. Ovary hairy at the top (Caucasus) 23. *F. amethystina* L.
- + Lemmas 3.5-5 mm long. Anthers 2 mm long. Caryopsis glabrous at the top 3.
3. Upper glume broadly lanceolate, obtuse or subobtuse. Lemmas 3.5-4 mm long. (Volyn') 24. *F. vaginata* W. et K.
- + Upper glume lanceolate, subacute. Lemmas 4-5 mm long 4.
4. Squat plants; leaves thickened-setaceous, 0.6-0.7 mm in diameter, stiff like the plant as a whole. Inflorescence short-branched, spiciform. (sands) ... 26. *F. dahurica* (St.-Yves) V. Krecz. et Bobr.
- + Tall plants; leaves slender, capillary, 0.3-0.4 mm in diameter, soft. Inflorescence elongate, oblong-pyramidal. (Forests, scrubs) 25. *F. jacutica* Drob.
5. (1) Plants producing extravaginal, reflexed lateral offshoots (Plate XL, Figure 2), and forming loose, sprawling tufts; leaves to 2.5 mm broad, flat, subinvolute or folded 6.
- + Plants producing intravaginal shoots (Plate XL, Figure 1) or both intravaginal and extravaginal shoots, in the latter case forming very compact, dense, or rather loose, but never sprawling tufts; leaves setaceous-involute, or folded and subinvolute, 1-1.5 mm in diameter 16.
- 500 6. Ovary and caryopsis hairy at the top (Caucasus) 35. *F. djimilensis* Boiss. et Bal.
- + Ovary and caryopsis glabrous at the top 7.
7. Lemmas glabrous or scaberulous 8.
- + Lemmas densely pilose 11.
8. Glumes broadly lanceolate, obtuse, prominently white-ciliate at the summit; lemmas abruptly narrowed to a short awn (Yakutiya) 33. *F. egena* V. Krecz. et Bobr.

- + Glumes lanceolate, acute, short-ciliate on the entire margin; lemmas gradually narrowed into a rather long awn 9.
9. Anthers 2-2.5 mm long. The upper glume 4-4.5 mm long 27. *F. rubra* L. s. str.
- + Anthers ca. 4 mm long. The upper glume 5-6 or 6-7 mm long 10.
10. Rhizome long-creeping; spikelets purple, lanceolate, 5-7-flowered. Glumes markedly unequal, 3-3.5 and 5.5-6 mm long respectively, lemmas (sands) 28. *F. baicalensis* (Griseb.) V. Krecz. et Bobr.
- + Rhizomes short; spikelets light green, broad, 7-12-flowered; glumes 4-4.5 and 6-7 mm long. Lemmas scabrous (Far East) 29. *F. aucta* V. Krecz. et Bobr.
11. (7) Glumes 5 and 6 mm long, or markedly unequal, 3-3.5 and 5.5-6 mm long, respectively. Anthers 4 mm long; rhizomes creeping 12.
- + Glumes 2.5-3.5 and 4-5 mm long. Anthers 2-3 mm long; rhizomes short 13.
12. Lemmas 7-7.5 mm long, densely pilose. Glumes 5 and 6 mm long 31. *F. arenaria* Osbeck.
- + Lemmas 5-6.5 mm long, rarely pilose. Glumes 3-3.5 and 5.5-6 mm long 28. *F. baicalensis* (Griseb.) V. Krecz. et Bobr.
13. The upper glume lanceolate. Lemmas narrowly lanceolate, covered with short, scattered hairs 27. *F. rubra* L. s. str.
- + The upper glume broadly lanceolate. Lemmas lanceolate, densely covered with long hairs 14.
14. Lemmas obtuse, abruptly produced into a short awn (Pamiro-Alai) 34. *F. Kirilovii* Steud.
- + Lemmas gradually tapering to an awn 15.
15. Leaves glabrous. The upper glume subobtuse or obtuse, broadly lanceolate, 3-3.5 mm long. Palea glabrous or glabrescent on the outside 30. *F. cryophila* V. Krecz. et Bobr.
- + Leaves pubescent on the upper surface. The upper glume acute, lanceolate, 5-5.5 mm long. Palea puberulent on the outside 32. *F. eriantha* Honda et Tatewaki.
- 501 16. (5) Anthers small, 0.7-1.3 mm long. Spikelets ovate, compact; glumes and lemmas ovate 17.
- + Anthers 2-3 mm long. Spikelets oblong, spreading; glumes and lemmas narrowly lanceolate or lanceolate 18.
17. Anthers 0.7-1 mm long. Lemmas 4-4.5 mm long, purple; culms smooth toward the top 20. *F. brevifolia* R. Br.
- + Anthers 1-1.3 (1.5) mm long. Lemmas 3.5-4 mm long, brownish; culms more or less pubescent toward the tip 21. *F. coelestis* (St.-Yves) V. Krecz. et Bobr.
18. Leaves of two kinds - capillary at the base and on the offshoots, flat on the culms. Awn as long as the lemma. Ovary scabrous at the top 22. *F. heterophylla* Lam.
- + Leaves of the offshoots and of the culms alike. Awn half as long as the lemma. Ovary glabrous at the top 19.
19. Leaves setaceous-involute, round or furrowed in section 20.
- + Leaves subinvolute or folded, easily flattened 36.
20. Leaves round or oval in section, with convex or flat (not concave) sides, or of undetermined shape in section (Plate XL, Figures 8, 9, 11, 12) 21.

- + Leaves biscuit-shaped in section, with strongly concave sides (Table XL, Figure 3) 29.
21. Leaves capillary-involute (0.3-0.5 mm in diameter), oblong or cuneate-oval in section 22.
- + Leaves setaceous-involute or wiry-involute (to 1 mm in diameter), round or broadly oval in section 25.
22. Dwarf (arctic and mountainous) plants, with smooth or almost smooth leaves 23.
- + Tall plants (of forest and plains), with scabrous leaves 24.
23. Panicle short, erect, 3-4 cm long, the lower branches bearing 1-2 spikelets each. Spikelets 3-5-flowered, usually purple. Lemmas lanceolate 3. *F. supina* Schur.
- + Panicle flexuous, 3-7 cm long, the lower branches bearing 2-3 spikelets each. Spikelets usually green. Lemmas narrowly lanceolate 4. *F. Ruprechtii* (Boiss.) V. Krecz. et Bobr.
14. Lemma 3-3.5 mm long. Anthers 2 mm long. Leaf sheaths closed only at the base 1. *F. ovina* L. s. str.
- + Lemma 3.5-4.5 mm long. Anthers 2-3 mm long. Leaf sheaths closed up to 1/4 or 1/3 of their length. The whole plant more robust (Yakutiya) 2. *F. pseudo-sulcata* Drob.
25. (21). Culms pubescent toward the tip; young sheaths pubescent; leaves wiry, round in section, rather smooth 26.
- 502 + Culms scabrous toward the tip; sheaths smooth; leaves setaceous, oval in section or with straight sides, scabrous 27.
26. Leaves abruptly pointed. The lower sheaths yellow, lustrous, rather scabrous. Branches and axis of inflorescence pubescent 6. *F. polesica* Zapal.
- + Leaves gradually acuminate to a fine point. The lower sheaths light brown, smooth. Inflorescence scabrous .. 7. *F. Beckeri* Hack.
27. Culms smooth below the lowest node 28.
- + Closely tufted plants; leaves stiff, mostly short, falcately reflexed or erect (1-1.1 mm in diam.); lemmas 3-4 mm long 5. *F. duriuscula* L.
- + Loosely tufted plants; leaves straight, elongate, stiff (to 0.7 mm in diam.); lemmas 4.5-5.5 mm long 12. *F. taurica* Kern.
29. (20). Ligules on lower culm-leaves with 2 oblong, pointed auricles (see Plate XL, Figure 7 c), to 1.5 mm long (Yakutiya) 13. *E. auriculata* Drob.
- + Ligules on lower leaves with rounded auricles, 0.2-0.5 mm long 30.
30. Leaves with sides so broadly grooved, that they appear flat, 0.8-1.2 mm broad, glaucous-green, short, falcate (Eastern Siberia) 19. *F. lenensis* Drob.
- + Leaves narrowly grooved, not more than 0.5-0.7 mm broad, grayish-green, straight or flexuous 31.
31. Spikelets 3-5 mm long. Lemmas 2-3.5 mm long; leaves much reduced in length, erect 8. *F. pseudovina* Hack.
- + Spikelets 7-12 mm long. Lemmas 4.5-5.5 mm long; leaves elongate, subflexuous 32.
32. Leaves slenderly setaceous, with numerous grooves, hexagonal in section. Spikelets purplish-brown, with brown margins (Caucasus) 18. *F. chalcophaea* V. Krecz. et Bobr.

- + Leaves triangular in section, with 2 grooves. Spikelets green, brownish-green or lilac-green 33.
33. Leaves capillary (0.3-0.4 mm in diam.), flexuous; culms strongly thickened toward the tip, rather smooth. Closely tufted plants 9. *F. sulcata* Hack.
- + Leaves setaceous (0.6-0.7 mm in diam.); culms not attenuate toward the tip, scabrous. Rather loosely tufted plants. 34.
34. Leaves strongly grooved, biscuit-shaped in section (Plate XL, Figure 3). Glumes green; lemmas and paleas brownish-green 10. *F. Ganeschini* Drob.
- 503 + Leaves obscurely grooved, with flat, or even convex, as well as grooved, sides. Glumes, lemmas and paleas of same color 35.
35. Panicle crowded, pyramidal owing to divaricate branches and spikelets. Leaf sheaths pinkish-brown; culms smooth below the nodes 12. *F. taurica* Kern.
- + Panicle loose, with remote and spreading spikelets and branches. Leaf sheaths light brown; culms scabrous below the lowest node. 11. *F. Bornmuelleri* (Hack.) V. Krecz. et Bobr.
35. (19). * Leaves rather flat or subinvolute, to 2 mm broad, scabrous toward the apex. Culms covered at the base with lustrous, yellowish sheaths. Panicle erect, contracted; spikelets dark-brownish-green; lemmas 4-5 mm long 16. *F. Kryloviana* Reverd.
- + Leaves folded, to 1 mm broad, smooth. Culms with reddish-brown basal sheaths. Panicle flexuous, loose; spikelets yellowish-green or light green; lemmas 5-6 mm long 37.
37. Leaves short. Spikelets yellowish-green (Caucasus) 15. *F. longiaristata* Somm. et Lev.
- + Leaves nearly as long as the culms. Spikelets light green (Far East) 17. *F. mollissima* V. Krecz. et Bobr.

Cycle 1. *Ovinæ* (Fr.) V. Krecz. et Bobr. -Plants producing intravaginal offshoots, or, if both intravaginal and extravaginal, the tufts are very compact, rather dense, or fairly loose, but not sprawling. Leaves setaceous-involute, or folded and subinvolute, 1-1.5 mm in diameter. Lemmas 3-4 (5.5) mm long, green, gradually tapering into an awn, usually half as long as the lemma. Anthers 2-2.5 mm long.

Series 1. *Ovinæ* V. Krecz. et Bobr. -Rather densely tufted plants. Leaves slender, capillary, oblong-oval in section. (Plate XL, Figure 4). Lemmas 3-4 mm long, the awn to half as long as its lemma. Anthers 2-2.5 mm long.

1. *Festuca ovina* L. (s. str.) Sp. pl. (1753) 73; Griseb. in Ldb. Fl. Ross. IV, 350 (excl. syn.). -*F. ovina* a *vulgaris* Koch, Syn. ed. 1, II (1838) 812; Shmal'g. Fl. II, 642. -*F. ovina* var. *vulgaris* f. *genuina* auct. Fl. Ross. -Ic.: Syr. III, fl. Mosc. g. (Illustr. to Fl. of Moscow Guberniya) I (1905) 147.

Perennial. Loosely tufted plants; culms slender, more or less 2-angled toward the tip, scabrous or smooth, 30-60 cm tall; leaves setaceous,

* One should refer to this stage *F. kolymensis* Drob. (see description in text under No 14). The types of this species have been lost, and it has not been possible to include it in the key, on account of inadequate description.

long, flexuous, slender, 0.4-0.5 mm in diameter, rather soft, subplane-cylindrical, scabrous; sheaths smooth or scabrous. Panicle oblong, rather loose, with spreading branches, often nodding; spikelets elliptical or oblong, 4-6 mm long, 3-6-flowered, light green; lemmas 3-4 mm long, glabrous or scaberulous toward the summit, the awn not exceeding half the length of lemma. May-June.

- 504 Meadows, pine woods, and light forests. -A boreal-European type, which does not extend southward in quantity beyond the northern limit of chernozem. -Eur. part: Kar. -Lap., Dv. -Pech., Lad. -Il'm., Upp. and Mid. Dnepr., Upp. and Mid. Volg., Volg. -Kam., Zavolzh. (Stavropol'skii Raion); Caucasus: Ciscauc.; West, Siberia: Ob' (north, part). Gen. Distr.: West. Europe. Described from western Europe. Type in London.

ECONOMIC IMPORTANCE. Furnishes good forage for livestock, but is of no great economic importance, on account of its distribution pattern.

2. *F. pseudo-sulcata* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XIV (1916) 156.

Perennial. Rather densely tufted; culms 20-60 cm tall, scabrous only below the panicle; leaves setaceous (0.3-0.7 mm across), to 20-30 cm long, flexuous and drooping, oblong-oval in section. Panicle 3-8 cm long, slightly nodding at the top; spikelets oblong, 3-5-flowered, 5-9 mm long, green or brownish; glumes acute, lanceolate, the lower 2.5-3 mm, the upper 3.5-4.5 mm long; lemmas 3.5-5 mm long, the awns half as long. June-July.

Sloping banks and light forests. -East, Siberia: Len. -Kol., Ang. -Sayan. (east), Daur. (north); Far East: Kamch., Ussur. Endemic. Described from the river Chona (Yakutiya). Type in Leningrad.

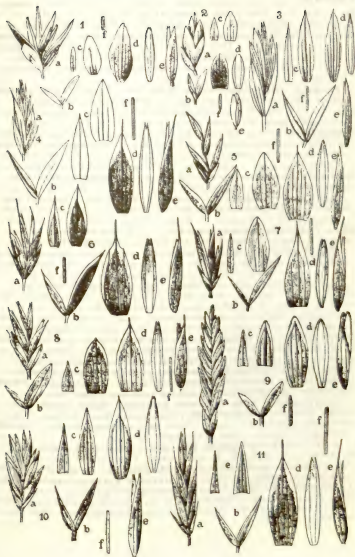
Series 2. *Supinae* V. Krecz. et Bobr. -Densely tufted, dwarf plants, with intravaginal offshoots. Leaves setaceous-involute (0.3-0.4 mm across), long, straight, rather smooth, cuneate-ovate or oval in section. Lemmas 3-4 mm long, the awns half as long. Anthers 2 mm long.

3. *F. supina* Schur., Enum. pl. Trans. (1866) 784. -*F. sphagnicola* Keller in Mem. Inst. Agr. Voroneg. XI (1928) 78.

Perennial. Plants producing intravaginal offshoots and forming loose tufts; culms 10-30 cm tall, 3-angled toward the tip, pubescent or scabrous; leaves setaceous-involute (0.3-0.6 mm in diam.), smooth, attaining half the length of the culm, arched, elliptical in section, with convex sides. Panicle 2-4 cm long, dense, oblong, the branches scabrous or pubescent at base, each bearing a solitary spikelet; spikelets 6-8 mm long, 3-5-flowered, purple or greenish-brown; lemmas 3.5-4 mm long, the awns one-third to half as long. Anthers 2 mm long. June. (Plate XL, Figure 8).

Explanation to Plate XXXIX

1. *Leucopoa albidus* (Turcz.) V. Krecz. et Bobr. -2. *L. karatavica* (Bge.) V. Krecz. et Bobr. -3. *L. sclerophylla* (Boiss. et Hohen.) V. Krecz. et Bobr. -4. *Festuca tristis* Kryl. et Ivanitt. -5. *F. cretacea* Caern. -6. *F. transchianica* Roshev. -7. *F. varia* Haenke. -8. *F. amblyodes* V. Krecz. et Bobr. -9. *F. pratensis* Huds. -10. *F. arundinacea* Schreb. -11. *F. orientalis* Kern. -In all figures: a) spikelet; b) glumes in side view; c) lower and upper glume; d) lemma and palea; e) lemma and palea in side view; f) anthers.



Moss-lichen and gravelly tundra of arctic and alpine zone. -Arctic: Nov. Zem., Arct. Eur., Arct. Sib.; West. Siberia: Alt.; East. Siberia: Ang. - Sayan; Far East: Sakh., Uda, Ussur., Okhot. -Kamch.; Caucasus: all mountainous regions. -Gen. Distr.: West. Eur., Asia, North America. Described from the Carpathian Mountains of Transilvania. Type in Vienna.

4. *F. Ruprechtii* (Boiss.) V. Krecz. et Bobr. sp. nova in Addenda p. 769. -*F. ovina* var. *Ruprechtii* Boiss. Fl. Or. V (1884) 619. - *F. ovina* ssp. *frigida* var. *Sommieri* St. -Yves in Candollea, III (1928) 371.

Perennial. Green, densely tufted plants; culms slender, erect, smooth, 5-15 cm tall, with smooth, light brown basal sheaths; leaves capillary (0.2-0.3 mm in diam.), smooth or scaberulous at the apex, more or less bent, cuneate-ovate in section, i.e., flat-sided. Panicle linear-oblong, flexuous, 3-6 cm long, the lowest branches short, each bearing 2-3 spikelets; spikelets oblong-elliptical, 5-7 mm long, greenish-purple, 4-6-flowered; lower glume subulate, ca. 2 mm long, upper glume lanceolate, 3-3.5 mm long, acute, rather smooth; lemmas lanceolate, to 4-4.5 mm long, scaberulous toward the summit, the awn one-third the length of its lemma; anthers 2 mm long.

Alpine zone. -Caucasus: West. and South. Transcauc., Ciscauc., Dag. Endemic. Described from Mount Diklo in Tushetiya. Type in Leningrad.

Series 3. *Duriusculae* V. Krecz. et Bobr. -Densely tufted plants. Culms scabrous or pubescent toward the tip. Leaves setaceous-involute, very stiff, round or oblong-rounded in section. (Plate XL, Figure 4). Lemmas 3-4 mm long, narrowly lanceolate, more or less scabrous, the awn barely reaching half the length of its lemma. Anthers to 2 mm long.

5. *F. duriuscula* L. Sp. pl. (1753) 74, non Syst. nat. II, 96. - *F. ovina* ♂ *duriuscula* Griseb. in Ldb. Fl. Ross. IV (1853) 351; Shmal'g. Fl. II, 642. -Ic.: Rchb. Ic. Fl. Germ. I fig. 1538; Syr. III. Fl. Mosk. g. (Illustr. to Fl. of Moscow Province) I (1905) 147.

Perennial. Rather densely tufted plants; culms sturdy, terete, angled toward the apex, smooth or scabrous, 15-50 cm tall; sheaths smooth; leaves stiff, reduced in length, stoutly setaceous (1-1.1 mm across), erect or reflexed, oblong-rounded in section, with thickened or convex sides, scabrous. Panicle rather dense, oblong; spikelets elliptical or oblong-elliptical, 6-10 mm long, 4-8-flowered, green or variegated greenish-purple; lemmas lanceolate, 3-4 mm long, smooth, the awn mostly exceeding half the length of its lemma; anthers 2 mm long. May-June.

On dry, sandy or sandy-loam soils - meadows, slopes, sands, pine woods. -European part: Lad. -Il'm., Upp. Dnepr. (Kursk?), Upp. Volg. (north-west. part). Gen. Distr.: Baltic region, Fenno-Scandia. Described from western Europe. Type in London.

508 6. *F. polesica* Zapal. in Bull. intern. Ac. Cracov. (1905) 303. - *F. sabulosa* Lindb. fil. in Sched. ad Pl. Finl. (1906). -*F. ovina* var. *sabulosa* Anderss. Gram. Scand. (1862) 23. -*F. glauca* Meinh., Pacz. et auct. compl. Fl. Ross. -*F. ovina* ♂ *glauca* Griseb. in Ldb. Fl. Ross. IV (1853) 351. -*F. ovina* var. *glauca* subvar. *caesia* Hack., Monogr. Fest. (1882) 95. -*F. ovina* var. *diversifolia* Choroschk. in Bull. Soc. Nat. Moscou, XXXIII (1925) 249. -Exs.: HFR No 97; Kneuck. No 384.

Perennial. Light green or yellowish-green plants, forming fairly compact tufts; culms terete, pubescent at the apex, 20-60 cm tall; sheaths tall, yellow, lustrous, scaberulous, puberulent toward the top; leaves long, wiry, erect, abruptly pointed, often scabrous. Panicle contracted, the branches and axis hirsute; spikelets green, 5-7 mm long, 4-6-flowered; lemmas scabrous, short-awned. May-July.

Grassless dunes and wooded sands. -Arctic: Arct. Eur. (Pechora); European part: Kar. -Lap. (estuary of Varzuga), Lad. -Il'm., Upp. Dnepr., Upp. Volg., Volg. -Kam., Volg. -Don, Low. Don (north. part). Gen. Distr.: Centr. Europe. Described from Poland: Rakotno and Kovel regions.

7. *F. Beckeri* Hack. Monogr. Fest. (1882) 210 (et 100 pro subsp.). -*F. ovina* var. *Beckeri* Schmalh. Fl. II (1897) 642.

Perennial. Dark, grayish-green plants; culms pubescent toward the tip, 30-60 cm tall; sheaths rather smooth, short, light brown; leaves wiry, gradually attenuate toward the apex, rather smooth. Panicle axis and branches scabrous. Spikelets grayish-green, 5-6 mm long, 4-6-flowered; lemmas scabrous, short-awned. May-July.

Sandy solonets soils of the steppe and semi-steppe zone. -European part: Prichern., Low. Don, Low. Volg., Zavolzh. (south. part); Caucasus: West. Transcauc. (Anapa); West. Siberia: Irt. (south. part); Centr. Asia: Aral. -Casp. Described from Krasnoarmeisk (Saperta). Endemic. Type in Vienna.

Series 4. *Sulcatae* V. Krecz. et Bbor. -Densely tufted plants. Culms smooth toward the tip or rather scabrous. Leaves setaceous-involute, more or less furrowed (Plate XL, Figure 3), scabrous. Lemmas and glumes from 2.5-5.5 mm long; lemmas narrowly lanceolate, awned (the awn half as long as its lemma); anthers 2-2.5 mm long.

8. *F. pseudovina* Hack. Monogr. Fest. (1882) 214. -*F. ovina* ssp. *sulcata* var. *pseudovina* Hack., l. c., 102.

Perennial. Tufted plants; culms slender, smooth or rather scabrous at the apex, 20-40 cm tall; leaves setaceous (0.2-0.6 mm in diam.), rather stiff, one-third as long as the culms, scabrous, furrowed, green or grayish-green. Panicle oblong, 2-6 cm long; spikelets small, 3-5 mm long, elliptical, green or somewhat purplish, 3-5-flowered; lower glume lanceolate, upper glume broadly lanceolate; lemmas broadly lanceolate, 2-3.5 mm long, the awns scarcely one-third as long (to 1-1.5 mm). Anthers 2 mm long. June. (Plate XL, Figure 6).

509 Mixed-grass steppes, meadows, coppices, weak solonets soils. -European part: Zavolzh. (east. part), Volg. -Kam. (south. part), Low. Volg., Low. Don (south); Caucasus: Ciscauc., Dag. (north); West. Siberia: Upp. Tob., Ob' (south. part), Irt., Alt. (north); East. Siberia: Ang. -Sayan. (west. part); Centr. Asia: Aral. -Casp., Upp. Turkm. (Gr. Balkhany). Endemic. Described from Mount Golubtsovskaya, near Krasnoufimsk. Type in Vienna.

9. *F. sulcata* Hack. Monogr. Fest. (1882) 215. -*F. ovina* ssp. *sulcata* var. *genuina* Hack., l. c., 105 et var. *valesiaca* Hack., l. c., 101. -*F. ovina* γ *valesiaca* Griseb. in Ldb. Fl. Ross. IV, 351, ex p.; Shmal'g. Fl. Yu. -Z. R. (Flora of Southwestern Russia) (1886) 690, non Koch. -*F. ovina* var. *pseudovina* Schmalh., l. c., non Hack.

Perennial. Densely tufted, grayish-green plants, with short, gray, narrow, smooth sheaths; culms 35-50 cm tall, smooth or scaberulous; leaves filiform (0.5 mm in diam.), flexuous, biscuit-shaped in section (with two rather deep grooves on the sides of a folded leaf), very scabrous, long (reaching the inflorescence), subflexuous. Panicle large, rather loose; spikelets large, 7-8 mm long, elliptical or oblong-elliptical, 5-6-flowered; glumes broadly lanceolate, green; lemmas 4-5 mm long, scabrous toward the summit, short-awned (awn about one-third as long as its lemma). May-June. (Plate XL, Figure 5 a-d).

Steppes. -European part: Prichern., Low. Don, Low. Volg., Zavolzh., Crimea; West. Siberia: Upp. Tob.; Caucasus: Ciscauc., West. Transcauc. (north. part), East. and South. Transcauc. Gen. Distr.: Rumania, Hungary, Poland. Described from Sarepta (Krasnoarmeisk). Type in Vienna.

ECONOMIC IMPORTANCE. Sheep's fescue, like the related species (*F. Beckeri*, *F. pseudovina*, etc.), is an excellent pasture and forage plant of steppes and semi-deserts it is particularly favored by small cattle and horses, and provides fattening spring forage for these animals. Its value is also greatly enhanced by the fact that it develops vigorously at the beginning of the summer, and produces new foliage in August, thus furnishing feed in fall and winter pastures. It stands up to trampling and, indeed, intensive grazing by cattle in needlegrass-fescue steppes brings about a reduction of needlegrass, with a resulting improvement of pasture. On account of its growth habit it is not suitable for cutting. The yields amount to 0.4-0.8 tons per hectare. In the vast expanses of northern and central Kazakhstan it is the leading pasture plant.

10. *F. Ganeschini* Drob. in Trav. Mus. Bot. Petrogr. XIV (1915) 175. -*F. cognita* in Animadv. Herb. Un. Tomsk. No 3-4 (1928) 7.

Perennial. Culms slender, scabrous at the tip, 40-70 cm tall; leaves grayish-green, setaceous-involute (0.3-0.5 mm in diam.), elongate, attaining half the length of the culm or more, flexuous, very scabrous, with a fairly pronounced furrow on both sides of the folded blade. Panicle contracted, 8-12 cm long; spikelets brownish-green, elliptical-elongate, 8-10 cm long, 5-7-flowered; glumes green, the lower to 3 mm, the upper to 4 mm long; Lemmas brownish, subulate-lanceolate, 5-6 mm long, smooth, or pilose-ciliate on upper part and on the margin, the awn not exceeding half the length of its lemma. May.

Grass steppes of plains and of the alpine zone, juniper woods, rock fissures. -Centr. Asia: Aral. -Casp. (east), Pribalkh., Dzung. -Tarb., Tien Shan, Pam. -Al. Endemic. Described from Akmolinsk Oblast', Karkaralinskii Raion, solonchaks of Turt-kul' Lake. Type in Leningrad.

11. *F. Bornmuelleri* (Hack.) V. Krecz. et Bobr. comb. nova. -*F. ovina* ssp. *Bornmuelleri* Hack. in Bull. Herb. Boiss. (1908) 823. -*F. ovina* var. *vulgaris* Trautv. in A. H. P. VII, 2 (1881) 621, pp. -*F. ovina* ssp. *valesiaca* auct. fl. Cauc. -Exs.: Herb. Fl. Cauc. No 303.

Perennial. Grayish-green, rigid, densely tufted plants; culms firm, erect, 40-80 cm tall, scabrous toward the tip, densely covered at the base with tall, light brown, smooth sheaths; leaves setaceous-involute, 1-1.2 mm in diam., elongate, scabrous on the upper part, with subconvex sides,

more or less oval in section. Panicle 10-15 cm long, loose, oblong; spikelets oblong, light green, 0.8-1.2 cm long, 4-8-flowered, subdivaricate; lower glume to 3 mm long, narrowly lanceolate, abruptly pointed, subcuculate; lemmas lanceolate, to 4-5 mm long, smooth or scabrous toward the summit (in the latter case short-pilose on the margin), the awn mostly 1/3 as long as its lemma; palea hispidulous or ciliate on the keels toward the summit; anthers 2.5 mm long. June.

Mountainous grass and mixed vegetation steppes. -Caucasus: East. Transcauc.; Centr. Asia: Upp. Turkm. (Kopet-dag). Gen. Distr.: Iran. Described from northern Persia: Mount Totchak of the El'brus mountain system.

12. *F. taurica* Kern, ex Hack, Monogr. Fest. (1882) 215. -*F. ovina* ssp. *sulcata* var. *taurica* Hack., *ibid.*, 104. -*F. ovina* ♂ *duriuscula* Griseb. in Ldb. Fl. Ross. IV, 351, quoad pl. taur.

Perennial. Loosely tufted, light green plants; culms 40-50 cm tall, scabrous toward the tip; leaves setaceous-involute (to 0.7 mm in diam.), attaining half the length of the culm, culm-leaves scabrous, oblong-oval in section, with plane or subconcave sides; sheaths puberulent toward the top. Panicle divaricate, with short branches and approximate spikelets, pyramidal, 8-15 cm long; spikelets 7-10 mm long, 5-7-flowered, green; glumes narrowly lanceolate; lemmas 4.5-5 mm long, scabrous at the summit, long-awned (awn to 3 mm long).

511 Dry slopes. -European part: Mountainous Crimea. Described from Bratskoe on the river Kostovataya. Endemic. Type in Vienna.

13. *F. auriculata* Drob. in Trav. Mus. Bot. Ac. Petrogr. XIV (1915) 159.

Perennial. Loosely tufted plants, with arcuate lateral shoots; culms smooth, 8-15 cm long; leaves setaceous, oval in section, nearly as long as the culm, rather scabrous, bent; ligule of the lower culm-leaves with auricles to 1.5 mm long. Panicle 2-3 cm long; spikelets 6-8 mm long, 3-4-flowered; glumes lanceolate, scabrous toward the summit, 3 and 4 mm long. Lemmas lanceolate, 4-5 mm long, scabrous toward the summit, the awn half as long as its lemma. Anthers 2 mm long.

Stone drifts. -East, Siberia: Len.-Kol. Endemic. Described from Panteleevskaya Hill in Kolymskii Raion. Type in Leningrad.

Cycle II. *Brunneo-virentes* V. Krecz. et Bobr. -Loosely tufted plants with extravaginal lateral shoots. Leaves setaceous, 0.4-0.8 mm in diam. Spikelets divaricate; lemmas (4.5) 5-6 mm long, brownish-green, scabrous toward the summit, subobtus, with awn to 2/3 as long. Anthers 2.5-3 mm long.

Series I. *Molliores* V. Krecz. et Bobr. -Loosely tufted plants. Leaves flat or folded, rather soft, mostly smooth. Lemmas 5-6 mm long, the awn more than half as long.

14. *F. kolymensis* Drob. in Trav. Mus. Bot. Ac. Petrogr. XIV (1915) 155. -*F. ovina* var. *duriuscula* Trautv. in A. H. P. V (1878) 569.

Perennial. Tufted plants; culms scaberulous below the inflorescence, 30-40 cm tall; leaves setaceous, 0.4-0.6 mm broad; ligule auricled, ciliate. Panicle dense, 3-5 cm long; spikelets oblong, 0.7-1 cm long, 6-7-flowered, dark-brownish-purple; glumes lanceolate, acute, scabrous toward the summit, the lower 3-3.5 mm long, the upper 4-4.5 mm long;

lemmas lanceolate, 5-6 mm long, scabrous on the margin and toward the summit, the awn up to half as long as its lemma; anthers ca. 3 mm long. June.

Slopes and rocks. -East. Siberia: Len. -Kol. (north-east). Endemic. Described from Kondzhaboi, 360 km from Nizhne-Kolymsk. Type in Lenin-grad.

15. *F. longiaristata* Somm. et Lev. Nuov. Giorn. Bot. It. (1897) 212. -*F. ovina* var. *longearistata* Hack. in Alboff, Pr. Fl. Colch. (1895) 263. -Ic.: A. H. P. XVI (1900) tab. XLVI.

Perennial. Plants forming small tufts; culms 6-20 cm tall, glabrous, geniculate in lower part; leaves 4-10 cm long, filiform, glabrous, involute, subobtusate. Panicle nearly 1-sided, nodding, with 4-7 remote spikelets and scabrous branches; spikelets (2) 4-6-flowered, 6-8 mm long, divaricate, oval-lanceolate, faintly purple, finally yellowish-green; glumes subulate-lanceolate, keeled, scabrous toward the summit, the lower 1-nerved, to 4 mm long, narrowly lanceolate, smooth on the back or sparsely scab-
512 rous, the upper 3-nerved, to 5 mm long, oblong-lanceolate, mostly glabrous on the back; lemmas 5-6 mm long, oblong-lanceolate, scabrous toward the summit, acuminate, produced into an awn which sometimes exceeds the lemmas in length; palea 2-keeled, ciliate on the margin, terminating in 2 scabrous teeth attaining nearly half its length; anthers 2.5-3 mm long. July.

High-mountain zone. -Caucasus: Ciscauc., Dag. (Gunib region), West. and South. Transcauc. Endemic. Described from Teberda. Type in Geneva.

16. *F. Kryloviana* Reverd. in Animadv. Syst. Herb. Univ. Tomsk. No 2 (1927) 3; Kryl. Fl. Zap. Sib. (Fl. West. Sib.) II, 321. -*F. Schlagintweitii* St. -Yves, ex p. -*F. ovina* subsp. *violacea* Kryl. Fl. Alt. i Tomsk. gub. (Flora of Altai and Tomsk Provinces) I (1914) 1674. -*F. ovina* ssp. *laevis* var. *Bungeana* St. -Yves in Bull. Soc. Bot. Fr. (1924) 41.

Perennial. Producing numerous innovations, densely tufted; culms erect or geniculate-ascending, 15-40 cm tall, compactly enveloped at the base by old, rusty-brown, fibrillose sheaths, closed from the base up to 1/3-1/2 of their length; leaves setaceous-conduplicate, scabrous. Panicle crowded, subspiciform-contracted, 3-5 cm long, the axis and branches scabrous; spikelets ovate or oblong-ovate, 6-8 mm long, greenish-dark-brown, 4-6-flowered; glumes cuneate-lanceolate, subobtusate, serrulate on the margin, the upper 3-nerved, 4-5 mm long, the lower 3.5-4 mm long; lemmas ovate-lanceolate, setulose-denticulate on the margin, scabrous on the back toward the summit, and scabrous, occasionally pilose, on lateral nerves below, narrowly scarious-margined, 4-5 mm long, obscurely 5-nerved, subcarinate toward the summit and scabrous on the keel, obtuse, terminating in a scabrous awn 1.5-2.5 mm long; palea lanceolate, short-bidentate at the tip, scabrous on the keels toward the summit; anthers pale yellow, oblong, 2-2.5 mm long. June-July. (Plate XL, Figure 22, a-c).

Alpine and subalpine meadows. -West. Siberia: Alt.; East. Siberia: Ang. -Sayan.(south); Centr. Asia: Dzung. -Tarb., Tien Shan. Gen. Distr.: Mongolia. Described from Altai. Type in Tomsk.

ECONOMIC IMPORTANCE. One of the best plants for grazing in mountain pastures.

NOTE. The species forms a distinct race in Turkestan.

17. *F. mollissima* V. Krecz. et Bobr. sp. nova, Addenda p. 770. - *Festuca ovina* auct. fl. Or. Extr.

Perennial. Light green plants; densely tufted; culms slender, smooth, pliant, 15-30 cm tall; leaves soft, smooth, flat, to 1-1.5 mm broad, or folded, rather straight, at first as long as the culm, finally shorter; spikelets solitary, or the lower ones in pairs on short branchlets, oblong, to 1 cm long, 4-5-flowered, subdivaricate, green with a purplish shade, forming an oblong, bent panicle, to 3 cm long; glumes lanceolate, acute, rather scabrous toward the summit, the lower 5 mm, the upper 6 mm long; lemmas lanceolate, scabrous toward the summit, 5-6 mm long, with awn 2/3 as long; palea as long as the lemma, scabrous; anthers 2.5 mm long. June-July.

- 513 Clefts and fissures of coastal rocks, -Far East: Ussur., Uda, Okhot., Sakh. Endemic. Described from the shores of De Kastri Bay. Type in Leningrad.

Series 2. *Coloratae* V. Krecz. et Bobr. -Leaves rather stiff, setaceous, narrowly grooved. Lemmas 5 mm long. Anthers to 3 mm long.

18. *F. chalcophaea** V. Krecz. et Bobr. sp. nova in Addenda p. 768.

Perennial. Compactly tufted plants with numerous culms; culms 20-50 cm tall, slender, smooth; leaves of innovations setaceous-involute, hexagonal in section, reduced in length, soft; culms surrounded with light brown sheaths to 10 cm long; culm-leaves (only on the lower part of the culm) to 10 cm long, ligule represented by an irregular, narrow fringe. Panicle contracted, erect, 3-7 cm long, main axis and branches scabrous; spikelets oblong, 8-12 mm long, 4-6-flowered, dark brown bronze-tinged; glumes lanceolate, acute, keeled, serrulate on the margin, often scabrous toward the summit, the upper 4-5 mm long, distinctly 3-nerved, the lower ca. 3 mm long, cuneate-lanceolate; lemmas lanceolate, 5 mm long, scabrous toward the summit, more or less membranaceous on the margin, obtuse, with a scabrous awn to 2 mm long, keeled in upper part, scabrous on the keel and below on lateral nerves, obscurely 5-nerved, purple on the back, brownish on the margins; palea oblong-lanceolate, bidentate, setulose on the keels toward the summit, hirtellous at the summit; anthers oblong, 2.5-3 mm long. July-August. (Plate XL, Figure 20 a-c).

High-mountain zone; -glacial moraines and meadows. -Caucasus: Ciscauc. (main range), West, and South. Transcauc. Endemic. Described from Armenia. Type in Leningrad.

Series 3. *Rigidulae* V. Krecz. et Bobr. -Leaves stiff, short, broadly furrowed. Lemmas 4-4.5 mm long. Anthers 2.5 mm long.

19. *F. lenensis* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XIV (1915) 158. -*F. ovina* Turcz. Fl. baic. dahur. II, 2 (1856) 139, non L.

Perennial. Loosely tufted; with short lateral offshoots; culms slender, smooth, 20-40 cm long; leaves short (1/4-1/3 the length of the culm), stiff, straight or arcuate, scabrous, subobtuse, setaceous (to 0.8 mm broad), plane or so strongly furrowed that the leaves often appear flat (especially in the case of Daurian plants). Panicle short, narrow, spiciform-crowded,

* From the words *khalkos* - honey, and *phcos* - dark, alluding to the dark honey coloration.

2.5 cm long, greenish-brown; spikelets oblong-ovate, 5-7 mm long, 3-5-flowered, greenish-brown or purplish-brown; upper glume to 4 mm long, lanceolate, the lower to 3 mm long, narrowly lanceolate, acute, glabrous, short-ciliate at the summit; lemmas lanceolate, 3-4 mm long, somewhat scabrous only near the summit, the awn half as long as the spikelet; anthers 2.5 mm long. June-July. (Plate XL, Figure 9).

- 514 Dry slopes and steppe sites. - West. Siberia: Alt. (east); East. Siberia: Yenisei, Len.-Kol., Ang.-Sayan.; Far East: Ze.-Bur., Uda, Ussur. Endemic. Described from Yakutiya. Type in Leningrad.

NOTE. The species apparently forms a distinct race in the Angara-Sayan region.

Cycle III. *Brevifoliae* V. Krecz. et Bobr. - Dwarf, loosely tufted plants, with mixed offshoots. Leaves short, folded, oval in section, reflexed, smooth. Glumes lanceolate, ciliate. Lemmas ovate, ca. 4 mm long, purple, scabrous toward the summit, the awn 1/3 as long as its lemma. Anthers 0.7-1.5 mm long.

20. *F. brevifolia* R. Br. Suppl. Append. Parry's Voy. CCLXXXIX (1824) non Muehl. - *F. ovina* ssp. *brevifolia* Hack. Mon. Fest. (1882) 117. - *F. brevifolia* var. *Czekanovski* Drob. in Trav. Mus. Bot. Ac. Sc. Petrog. XIV (1915) 161, tab. VI, ff. 10-13 et 18. - *F. ovina* var. *violacea* Trautv. in A. H. P. V (1877) 134; *ibid.*, X (1887) 540.

Perennial. Tufts loose, with subascending shoots; culms 10-20 cm tall, erect or geniculate at the base, smooth; leaves 3-6 cm long, reflexed, ob-
515 erse, setaceous-conduplicate (0.5-0.7 mm in diam.), angled in section (see Plate XL, Figure 11), smooth. Panicle dense, linear, 2-3 cm long, its branches bearing solitary spikelets, only the lowest branch with 2-5 spikelets; spikelets elliptical, 5-6 mm long, 3-4-flowered, dark purple; glumes lanceolate or broadly lanceolate, subacute, ciliate on the margin, the lower 2 mm long, the upper 2.5-3 mm; lemmas elliptical-lanceolate, 4-4.5 mm long, scabrous only toward the summit, the awn attaining 1/3 the length of its lemma, purple, rusty-brown on the margin; anthers 1/6-1/4 as long as the lemmas, measuring 0.6-0.8 mm in length. May-June. (Plate XL, Figures 10 a-d and 11).

Mountain slopes in the arctic region, tundra, bare Siberian hills. - Arctic: Nov. Zem., Arctic Eur., Arctic Sib., Chuk., Anad.; West. Siberia: Alt., East. Siberia: Ang.-Sayana., Daur. (bare hills of Vitimskoe Plateau); Far East: Kamch. Gen. Distr.; West. Eur. (north. part), North America. Described from Greenland (69° N lat.). Type in London.

21. *F. coelestis* (St.-Yves) V. Krecz. et Bobr. sp. nova in Ad-
515 denda p. 770. - *F. ovina* ssp. *coelestis* St.-Yves in Candollea III (1928) 376.

Perennial. Green, densely tufted plants; culms slender, strict, 5-20 cm tall, with short, brown old sheaths at the base; leaves setaceous-involute, 0.5-0.6 mm in diam., rather stiff, mostly straight, reduced in length, smooth, oval in section (with subconvex sides). (Plate XL, Figure 12).

Panicle dense, 2-3 cm long, linear, the short branches bearing 1-2 (3)
515 spikelets each; spikelets elliptical, purple, 5-6 mm long, 3-6-flowered; lower glume attenuate, lanceolate, acute, ca. 2 mm long, the upper broadly lanceolate, subovate, ca. 3 mm long, subacute, both ciliate on the margin; lemmas broadly lanceolate or subovate, ca. 3.5-4 mm long, brownish-purple, smooth, ciliate on the margin toward the summit, the awn

exceeding $1/3$ the length of its lemma; palea scabrous on the keels and the back toward the summit; anthers $1/4-1/3$ as long as the lemmas (1-1.3 mm). July-August. (Plate XL, Figure 12).

Alpine zones, at an altitude of 2,000-4,000 m. -Centr. Asia: Tien Shan, Pam. -Al. Endemic. Described from central Tien Shan. Type in Lenin-grad.

Cycle IV. *Heterophylla* V. Krecz. et Bobr. -Densely tufted plants; offshoots predominantly intravaginal, but also extravaginal. Leaves of innovations setaceous-involute, those of the culm flat. Lemmas 5-6.5 mm long, awn nearly as long. Ovary scabrous at the top.

22. *F. heterophylla* Lam. Fl. Fr. ed. 1 (1778) 600; Griseb. in Ldb. Fl. Ross, IV, 351; Shmal'g. Fl. Yu. -Z. R. (Schmalh. Fl. South-western Russia) (1886) 690. -*F. rubra* L. subsp. *heterophylla* Hack. Mon. Fest. (1882) 130.

Perennial. Tufted plants; culms 40-100 cm tall, smooth; basal leaves 7.5 mm in diam., setaceous-folded, scabrous, to 20-40 cm long, with light brown, smooth, often fibrillose sheaths; culm-leaves flat, 2-4 mm broad, pubescent on the upper surface. Panicle to 15 cm long, open in anthesis, nodding at the top, the branches scabrous, the longest of the 2-3 lowest branches attaining half the length of the panicle and spikelet-bearing only in upper part; spikelets light green, 8-10 mm long, 4-6-flowered, narrow; glumes keeled, fine-pointed, prominently nerved, the lower cuneate-lanceolate, ca. 5 mm long, 1-nerved, the upper narrowly lanceolate, 6 mm long, 3-nerved, scabrous on the keel toward the summit; lemmas linear-lanceolate, 5-6.5 mm long, long-acuminate, with a membranaceous margin, glabrous, scabrous on the mid-nerve toward the summit, prolonged into a scabrous awn often as long; palea linear-oblong, entire at the tip, scabrous on the keel toward the summit; anthers oblong, ca. 2 mm long. May-June. (Plate XL, Figure 17).

Dry, shady forests. -European part: Mid. Dnepr.; Caucasus: West. Transcauc. (Sukhum), Ciscauc. (Pyatigorsk, a forest on Mashuka). Gen. Distr.: West. Europe, Asia Minor. Described from France. Type in Paris.

Cycle V. *Inarmata* V. Krecz. et Bobr. -Plants with intravaginal offshoots; sheaths long, smooth. Leaves slender, smooth, oval in section. Glumes rather broadly lanceolate, subobtuse or obtuse. Lemmas subacute, awnless, 4-6 mm long. Anthers ca. 3 mm long. Ovary rather hairy at the top.

23. *F. amethystina* L. Sp. pl. (1753) 74, non Host; Boiss. Fl. Or. V, 620.

516 Perennial. Densely tufted plants; culms scabrous toward the apex, 30-50 cm tall, covered at the base with entire, light yellow sheaths; leaves setaceous, oval in section, elongate, shorter than the culm. Panicle oblong, somewhat nodding; spikelets oblong-ovoid, 6-10 mm long, 6-8-flowered, loose, greenish, purple-tinged; glumes subequal, lanceolate, the lower 4-4.5 mm, the upper 4.5-5 mm long; lemmas 5.5-6 mm long, acuminate but awnless, scabrous on the margin toward the summit; paleas somewhat shorter; anthers 3 mm long, narrow. May-June.

Caucasus: West. Transcauc. (Batumskii Raion: Adzharis-tskhali (A. Grossheim). Gen. Distr.: West. Europe, Asia Minor. Described from the eastern part of the Alps. Type in London.

24. *F. vaginata* W. et K. in Willd. Enum. (1809) 166. -*F. ovina* s. *vaginata* Griseb. in Ldb. Fl. Ross. IV (1853) 351. -*F. ovina* ssp. *eu-ovina* var. *vaginata* Hack. Monogr. Fest. (1882) 97. -*F. glauca* Bess. Enum. pl. (1822) 5.

Perennial. Tall, loosely tufted plants; culms 40-60 cm tall, obtusely angled or terete, sulcate, smooth; sheaths long, entire, very broad, grayish-yellow (pruinose), smooth; leaves thick, setaceous (0.8-1 mm in diam.), terete, smooth, stiff, straight. Panicle to 10 cm long, open, finally contracted; spikelets small, 5-6 mm long, elliptical, 3-6-flowered; upper glume oblong-ovate, obtuse subobtusate or subacute, ciliate on the margin; lemmas 3.5-4 mm long, oblong-lanceolate, scabrous toward the summit, more or less ciliate in upper part, acute, awnless or very short-awned. June.

European part: Mid. Dnepr. (possibly in western part); recorded by Besser and Eichwald for Podoliya. Gen. Distr.: Poland (Krzemieniec), Hungary, Romania. Described from Hungary.

Cycle VI. *Extremae* V. Krecz. et Bobr. -Plants with intravaginal and extravaginal offshoots, rather densely tufted. Leaves setaceous-involute. Inflorescence oblong. Spikelets oblong; glumes lanceolate, subacute; lemmas 4-5 mm long, scabrous near the summit, awnless. Anthers 2 mm long. Ovary naked.

25. *F. jacutica* Drob. et Trav. Mus. Bot. Ac. Sc. Petrogr. XIV (1915) 163, tab. VI, ff. 14-17 et 19. -*F. ovina* var. *vulgaris* Trautv. in A. H. P. V, 1 (1877) 134 et auct. fl. Sib. -*F. tenuifolia* Turcz. in Bull. Soc. Nat. Mosc. XI (1838) 105, non Sibth.

Perennial. Loosely tufted, with short, reflexed lateral shoots; culms 50-70 cm tall, firm, smooth; leaves capillary (0.3-0.4 mm in diam.), green, long (up to 30 cm), flexuous, rounded-6-8-angled in section, smooth or scaberulous (mainly toward the apex); the lower sheaths tall, stramineous, lustrous. Panicle oblong, 5-10 cm long, with slender, flexuous, 517 rather scabrous branches; spikelets oblong-ovate, 5-7 mm long, 4-7-flowered, greenish or rather purplish; glumes narrowly lanceolate, the lower 1.5-2.5 mm long, the upper 2-3.5 mm long; lemmas lanceolate, 4.5 mm long, acuminate or at most very short-awned, scaberulous only near the summit; anthers to 1.5-3 mm long. July.

Meadows, light forests, scrubs, and stony slopes. -East. Siberia: Yenisei, Len.-Kol., Daur.; Far East: Ze.-Bur., Uda, Ussur. Endemic. Described from the surroundings of Yakutsk, in the Lena River valley. Type in Leningrad.

26. *F. dahurica* (St.-Yves) V. Krecz. et Bobr. sp. nova in Adenda p. 770. -*F. ovina* ssp. *laevis* var. *dahurica* St.-Yves in Bull. Soc. Bot. Fr. LXXI (1924) 40.

Perennial. Grayish-green, densely-tufted plants; culms 25-40 cm tall, erect, rigid, smooth; leaves setaceous, 0.6-0.7 mm in diam., stiff, reflexed, with convex sides; the lower sheaths broad, lustrous, light brown, smooth. Panicle oblong, 5-8 cm long, dense; spikelets oblong-elliptical, 7-8 mm long, 4-6-flowered, green or somewhat purplish; the lower glume 2-2.5 mm, the upper 3-3.5 mm long, both acute, very scabrous toward the summit; lemmas 4-5 mm long, broadly lanceolate, awnless or with a short-awn-point, scabrous near the summit; anthers 2 mm long. June-July. (Plate XL, Figure 13 a, b).

Sands and sandy soils. -East. Siberia: Ang. -Sayan., Daur. Endemic. Described from Zabaikal'e [Trans-Baikal region] (Seleginsk). Type in Leningrad.

Cycle VII. *Rubrae* V. Krecz. et Bobr. -Plants producing only extra-vaginal shoots, and forming loose, sprawling tufts. Leaves to 2.5-3 mm broad, flat, subinvolute or conduplicate. Lemmas 5-7 mm long, with awn to 1/2 as long. Anthers (2.5) 3-4 mm long.

Series 1. *Rubrae* V. Krecz. et Bobr. -Fairly large plants, with leaves to 2 mm broad, glabrescent or glabrous; anthers 2-2.5 mm long.

27. *F. rubra* L. Sp. pl. (1753) 74; Griseb. in Ldb. Fl. Ross. IV, 352; Shmal'g. Fl. Yu. Z. R. (Schmalhausen, Flora of Southwestern Russia) (1886) 690. -Ic.: Syreishchikov, Il. Fl. Mosk. g. (Illustrations to the Flora of the Moscow Province) I (1905) 148. -Exs.: Kneuck. No 593.

Perennial. Plants with strong creeping rhizomes, forming loose tufts; culms 20-75 cm tall, erect or ascending at the base, smooth or scabrous below the panicle, covered at the base with reddish-brown sheaths, the upper sheaths glabrous, the lower ones pubescent; leaves to 2.5 mm broad, linear, the basal leaves folded, rhomboidal in section, with bundles of mechanical tissue at the angles; ligule represented by a narrow fringe. Panicle to 10 cm long, open in anthesis, subsequently contracted, the lower branches usually arranged in twos; spikelets greenish or brownish, 6-12 cm long, lanceolate, 4-7 (10)-flowered, the axis setose; glumes acute, lanceolate, scabrous on the keel toward the summit, the upper 4.5 mm long, 3-nerved, lanceolate, the lower to 3-3.5 mm long, cuneate-lanceolate; lemmas narrowly lanceolate, 5-6 mm long, convex, obscurely 5-nerved, 518 glabrous, or else somewhat scabrous or sparsely pilose toward the margin near the summit, the awn 1/3-1/2 as long as its lemma; caryopsis 3-4 mm long; anthers oblong, 2-2.5 mm long. May-June. (Plate XL, Figure 14 a-d).

Meadows. -European part: Caucasus, Siberia, central Asia, and the Far East. Gen. Distr.: western Europe, North America, Asia Minor, and central Asia. Described from western Europe. (Apparently forms distinct races in the Far East and in central Asia).

ECONOMIC IMPORTANCE. Red fescue is a good pasture plant, forming a close sward, to 60 cm tall, on moist sandy loams. Yields approximately 1.5-2.0 tons of hay per hectare. It is recommended to cut it before flowering. Can be used as a lawn grass.

Series 2. *Auctae* V. Krecz. et Bobr. -Large plants with leaves to 2.5 mm broad. Spikelets large, many-flowered. Lemmas 6-7 mm long, rather scabrous; anthers ca. 4 mm long.

28. *F. baicalensis* (Griseb.) V. Krecz. et Bobr. sp. nova in Adenda p. 768. -*F. nigrescens* Turcz. in Bull. Soc. Nat. Mosc. XI (1838) 105, non Lam. -*F. rubra baicalensis* Griseb. in Ldb. Fl. Ross. IV (1853) 352 (quoad pl. baicalensem); Turcz. Fl. baic.-dah. II, 1 (1856) 340. -*F. rubra* var. *arenaria* Roshev. in Fl. Transb. I (1929) 89.

Perennial. All plants purplish-green, with elongate, flagelliform stolons; culms 40-80 cm tall, erect or geniculate-ascending at the base, the basal sheaths loose, reddish, the upper sheaths smooth or pubescent, extending into a shortened blade, to 2.5 mm broad, flat or canaliculate; ligule narrowly fimbriate. Panicle oblong, contracted, 5-15 cm long, slightly

nodding 1-sided, the axis and branches scabrous; spikelets oblong-lanceolate, sublinear, 5-7-flowered, 10-15 mm long, 3-4 mm broad, with a setulose-scabrous rachilla; glumes acute, more or less keeled, serrulate and very narrowly membranaceous on the margin; the upper glume lanceolate, distinctly 3-nerved, 5-6 mm long, the lower cuneate-lanceolate, 3-3.5 mm long, 1-nerved; lemmas purple, narrowly membranaceous toward the summit, 6-7 mm long, broadly lanceolate, serrate on the margin, with a distinct, scabrous keel in upper part, excurrent into an awn 4 mm long, obscurely 5-nerved with marginal nerves distant, scaberulous, bidentate, ciliate on the margin, occasionally (when lemma pubescent) short-pilose near the summit; anthers narrowly linear, ca. 4 mm long. June-July.

Sands. -East, Siberia: Daur. (Baikal). Endemic. Described from the coast of Lake Baikal. Type in Leningrad.

29. *F. aucta* V. Krecz. et Bobr. sp. nova in Addenda p. 767. -*F. rubra* var. *paludicola* Kom. Fl. penins. Kamtsch. I (1927) 188. -*F. rubra* var. *barbata* Kom., ibid. ex p.

- 519 Perennial. Loosely tufted plants; culms 30-80 cm tall, smooth, shining; leaves of innovations long, attaining half the length of the culm, flat or subinvolute, to 2.5 mm broad, scaberulous, their sheaths often pubescent, culm-leaves to 10 cm long, flat, broad (3-4 mm), scaberulous, their sheaths smooth, broad. Panicle mostly subsecund-nodding, loose, with flexuous, scabrous branches; spikelets oblong, appressed at first, later divaricate, 10-16 mm long, 7-11-flowered, green, sometimes faintly purple, rachilla scabrous; glumes acute, keeled, the upper 6-7 mm long, lanceolate, membranaceous-margined, scabrous on the keel and ciliate on the margin toward the summit, the lower narrowly lanceolate, 4-4.5 mm long; lemmas lanceolate, keelless, 6-7 mm long, produced into a scabrous awn to 3 mm long, scaberulous all over the surface, sometimes hirtellous, obscurely nerved; palea narrowly lanceolate, ciliate on the keel down to the base, scabrous toward the summit, bidentate; anthers oblong, 3.5-4 mm long, dark-colored. July-August.

Wet meadows and marshes. -Far East: Sakh., Kamch. and Komand. Islands. Described from Komandor Islands. Type in Leningrad.

Series 3. *Erianthae* V. Krecz. et Bobr. -Plants with creeping rhizomes; leaves to 2 mm broad, mostly folded. Glumes lanceolate, subobtus, 5-6.5 mm long. Lemmas lanceolate, subobtus, the awn to 1/3 as long as its lemma. Anthers 2.5-3 mm long.

30. *F. cryophila* V. Krecz. et Bobr. sp. nova in Addenda p. 767. -*F. rubra* var. *vel f. arenaria* Holmb., Lyngb., et alii auct. fl. Scand., non Fr.; Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XIV (1915) 167. -*F. rubra* var. *arenaria f. arctica* Hack. Mon. Fest. (1882) 140.

Perennial. Green plants with stolons reduced in length, forming loose tufts; culms 10-50 cm tall, geniculate-ascending, enveloped at the base by reddish or brownish sheaths; leaves 2-5 cm long, reclinate, subinvolute, abruptly tapering, subobtus, smooth. Inflorescence a few-flowered, short, apiculately contracted panicle, 2-5 cm in length, with scabrous axis and branches; spikelets ovoid or ellipsoid, 5-8 (10) mm broad, with sparsely pilose rachilla, greenish-brown, variegated; glumes subacute or often subobtus, glabrescent, lustrous, with prominent nerves and membranaceous, ciliolate margin, purplish-brown, the upper broadly lanceolate, often

subovate, 3-3.5 (4) mm long, 3-nerved, the lower 1-nerved, 2-2.5 (3) mm long; lemmas broadly lanceolate, subovate, 4.5-5 (6) mm long, short-awned, uniformly and densely covered with curly hairs, purplish-green; palea short-setulose-ciliolate on the keels. Anthers 2-2.5 mm long, yellow or purple. (Plate XL, Figure 16 a-d).

Arctic: Nov. Zem., Arctic Eur. (Polar Ural), Arctic Sib. Endemic. Described from Yugorskii Shar: Khabarovo, estuary of the river Ogo. Type in Leningrad.

- 520 31. *F. arenaria* Osbeck ex Retz. Diss. suppl. Fl. Scand. (1805)
4. -*F. rubra* β *arenaria* Griseb. in Ldb. Fl. Ross. IV (1853) 352. -
Exs.: HFR No 47.

Perennial. Grayish-green plants with long, flagelliform rhizomes; culms 30-60 cm tall, smooth, arcuately or geniculately ascending, covered at the base with purplish-brown sheaths, sulcate in upper part; leaves setaceous-involute, 10-15 cm long (to 2 mm broad), abruptly pointed; ligule short (scarcely attaining 1 mm in length), with short, round auricles on the sides of the leaf. Inflorescence an oblong, somewhat contracted panicle, 5-15 cm long, with pubescent or scabrous axis and branches; spikelets ovate or oblong-ovate, 1-1.5 cm long (5-8 mm broad), 6-9-flowered, grayish-green or brownish-green, with pilose rachilla; glumes subacute, keeled, scabrous on the margin and keel toward the summit, often rather sparsely pilose, narrowly membranaceous on the margin, the upper 5-6 mm long, broadly lanceolate, prominently 3-nerved, the lower narrowly lanceolate, 4-5 mm long, 1-nerved; lemmas lanceolate, 7-8 mm long, terminating in a short (1-2 mm), scabrous awn, uniformly covered with slender long hairs, not prominently nerved; palea oblong-lanceolate, deeply bidentate, ciliate on the keels; anthers narrow, to 4 mm long, yellow. June-August. (Plate XL, Figure 15 a-d).

- 523 Maritime and lacustrine sands. -Arctic: Arctic Eur.; European part: Lad. -Il'm. (Gulf of Finland; Chudskoe, Onezhskoe, and Ladozhskoe Lakes), Dv. -Pech. Gen. Distr.: Scand. and northern part of Atlant. Eur. Described from Sweden.

32. *F. eriantha* Honda et Tatewaki in Trans. Sapporo Nat. hist. Soc. IX (1927) (nomen); Honda in Tokyo Bot. Mag. XLII (1928) 185. -
F. rubra var. *alpina* Kom., Fl. Penin. Kamtsch. I (1927) 188.

Perennial. Grayish-green plants, with creeping rhizome; culms erect or ascending, 10-30 cm tall; sheaths sparsely pubescent, leaves flat or involute, 1-2 mm broad, short-pubescent on the upper surface, glabrous underneath. Panicle oblong, contracted, 3-5 cm long, the main axis and branches scabrous or short-pubescent; spikelets lanceolate, 8-12 mm long, 5-7-flowered, grayish-purplish-green, with scabrous rachilla; glumes keeled, acute, denticulate on the margin, the upper lanceolate, 5-6 mm long, prominently 3-nerved, membranaceous on the margin, often pilose, the lower 3-4 mm long, narrowly lanceolate; lemma oblong-ovate, 5-6 mm long, obscurely 5-nerved, prolonged into a scabrous awn, 1-2 mm long, puberulent all over the surface; palea lanceolate, rather short-pubescent all over the surface, ciliate on the keels nearly down to the base, bidentate at the tip; anthers purple, oblong, 2.5 mm long. July-August. (Plate XL, Figure 19 a-c).



Dry meadows and stony slopes of the alpine zone. -Arctic: Anad.; Far East: Kamchatka (southern part). Gen. Distr.: Kuril'skie Islands. Described from Kuril'skie Islands: Minami-ura. Type in Japan.

33. *F. egena* V. Krecz. et Bobr. in Addenda p. 769. -*F. rubra* var. *glabra* Trautv. in A. H. P. V. (1877) 135.

Perennial. Rhizome creeping; culms few, smooth, erect, to 40 cm tall, covered in lower part with reddish-brown sheaths and surrounded by arcuately bent leaves of innovations to 1 mm broad, often flat or folded, to 10 cm long, culm-leaves rather flat, reduced in length, to 3.5 mm broad, rather scabrous on the upper surface, smooth underneath, to 6 cm long, with ligule forming a faint fringe. Panicle short-branched, contracted, sublinear-oblong, axis and particularly branches smooth; spikelets oblong-lanceolate, 8-12 mm long, 4-6-flowered, dense, constricted, pale purple,

Explanation to Plate XL

Festuca. -1. Outline of intravaginal mode of shoot growth. -2. Outline of intravaginal mode of shoot growth. -3. Cross section of a leaf of *F. sulcata*, showing disjointed arrangement of mechanical tissue in 3 bundles, which accounts for the furrowing of the sides in dissected leaves. -4. Cross section of a leaf of *F. ovina* L., with compact arrangement of mechanical tissue, which accounts for the roundness or convexity of the sides of the leaf blade. -5. *Festuca sulcata* Hack.: a) spikelet; b) glumes; c) lemma; d) anthers. -6. *Festuca pseudovina* Hack.: general view of a spikelet (for comparison with preceding species). -7. Outline of auricle and ligule. -8. Cross section of a leaf of *Festuca supina* Schur. -9. Cross section of a leaf of *Festuca lenensis* Drob. -10. *F. brevifolia* R. Br.: a) spikelet; b) upper and lower glume; c) lemma and palea; d) glumes in side view. -11. Cross section of a leaf of *Festuca brevifolia* R. Br. -12. Cross section of a leaf of *Festuca coelestis* (St.-Yves) V. Krecz. et Bobr. -13. *Festuca dahurica* (St.-Yves) V. Krecz. et Bobr.: a) spikelet; b) cross section of a leaf. -14. *F. rubra* L. s. str.: a) spikelet; b) glumes; c) lemma and palea; d) anthers. -15. *F. arenaria* Obeck.: a) glumes in side view; b) upper and lower glume; c) lemma and palea; d) anthers. -16. *F. cryophila* V. Krecz. et Bobr.: a) spikelet; b) glumes; c) lemma and palea. -17. *F. heterophylla* Lam.: spikelet. -18. *F. egena* V. Krecz. et Bobr.: a) spikelet; b) glumes; c) lemma and palea; d) anthers. -19. *F. eriantha* Honda et Tatewaki: a) glumes in side view; b) lower and upper glume; c) lemma and palea. -20. *Festuca chalcidophaca* V. Krecz. et Bobr.: a) glumes in side view; b) upper and lower glume; c) lemma and palea. -21. *F. Krilovii* Steud.: a) glumes in side view; b) lower and upper glume; c) lemma and palea. -22. *F. Kryloviana* Reverd.: a) glumes in side view; b) lower and upper glume; c) lemma and palea. -23. *F. gigantea* (L.) Vill.: a) spikelet; b) upper and lower glume; c) lemma and palea; d) anthers. -24. *F. extremiorientalis* Ohwi: a) spikelet; b) lower and upper glume; c) lemma and palea; d) anthers. -25. *F. silvatica* (Poll.) Vill.: a) spikelet; b) culm bases covered with scaly sheaths; c) ligule; d) lower and upper glume; c) lemma and palea; d) anthers.

sometimes green, with scabrous rachilla; glumes obscurely keeled, sub-
obtuse, white-ciliate, the upper oblong-ovate, to 4 mm long, the lower
cuneate-lanceolate, 2.5-3 mm long, obscurely nerved; lemmas oblong-
lanceolate, to 6 mm long, ciliate on the margin, terminating rather abrupt-
ly in a short (to 2 mm), scabrous awn, keelless, scaberulous toward the
summit, purple, green on the back toward the base, narrowly membrana-
ceous-margined toward the summit; palea lanceolate, ciliate on the keels
toward the summit, scabrous on the back; anthers oblong, 2.5-3 mm long.
July-August. (Plate XL, Figure 18 a-d).

- 524 Grassy slopes and tundra. -East. Siberia: Yakutsk.; Far East: Kamch.
(north), Okhotsk. (north). Endemic. Described from Kolyma. Type in
Leningrad.

Series 4. *Pseudo-erianthae* V. Krecz. et Bobr. -Loosely tufted
plants with reduced, falcately reflexed leaves. Lemmas ovate, 3-4 mm
long, obtuse, the awn half as long as its lemma. Anthers 2.5 mm long.

34. *F. Kirilovii* Steud. Syn. Gram. (1855) 306. -*F. rubra* var.
alaica Drob. in Tr. Mus. Bot. Ac. Sc. Petrogr. XVI (1916) 135. -
F. rubra var. *arenaria* Roshev. in A. H. P. XXXVIII (1904) 125, ex
p. -Exs.: Herb. Kronenburg. No 44.

Perennial. Rigid plants, greenish-purple, loosely tufted; culms 20-50 cm
tall, erect, geniculate only at the base; covered in lower part with inflated,
smooth, colored, sheaths terminating in reduced, abruptly pointed, smooth,
folded blades to 3 cm long; the basal leaves to 10 cm long, rather stiff,
2 mm broad, folded, straight or falcate, smooth, abruptly pointed, their
sheaths brown. Panicle spiciform-contracted, 3-6 cm long, the axis and
branches scabrous and often pilose; spikelets oblong-ovate, 8-10 mm long,
dense, 4-6-flowered, grayish-purple; glumes acute, keeled, ciliate on
the margin, prominently nerved, the upper lanceolate, 4-4.5 mm long, often
pilose toward the summit, scarious-margined, the lower lanceolate,
3-4 mm long, scarious toward the summit; lemmas lanceolate, obtuse,
obscurely nerved, purple, often covered with woolly hairs, the awn frequent-
ly bent, to 2 mm long; palea oblong-lanceolate, short-bidentate, nearly the
entire length of its lateral nerves scabrous; anthers oblong, to 2.5 mm
long, purplish. July-August. (Plate XL, Figure 21 a-c).

Meadows of the alpine zone. -Centr. Asia: Tien Shan, Pam. -Al. En-
demic. Described from Dzhungariya. Type in Berlin.

Series 5. *Acrolasiae* V. Krecz. et Bobr. -Glumes narrowly lanceo-
late; lemmas narrowly lanceolate, to 7 mm long. Anthers 3 mm long.
Ovary hairy on the top.

35. *F. djimilensis* Boiss. et Bal. in Bull. Soc. Bot. Fr. XXI
(1874) 18. -*F. calceolaris* Som. et Lev. in Nuov. Giorn. Bot. It. IV
(1897) 211; Grossg. Fl. Kavk. (Fl. of the Caucasus) I, 119. -*F. rubra*
var. *djimilensis* Hack. in Boiss. Fl. Or. V (1884) 621.

Perennial. Subcespitose plants, with creeping rhizomes; culms to
100 cm tall, shining, slender; both culms and innovations covered in low-
er part with brown sheaths; leaves of the innovations sometimes nearly as
long as the culms, folded, ca. 1 mm broad, scabrous on the margin, often
pubescent on the upper surface in lower part; culm-leaves shorter; ligule
narrow, short-ciliate on the margin. Panicle to 15 cm long, rather open,
the axis and branches scabrous; spikelets oblong-lanceolate, light green,
not dense, 5-6 (?) -flowered, to 15 mm long; glumes membranaceous-

525 margined toward the summit, acuminate, scaberulous in upper part, ciliate late, 1-nerved, to 4 mm long, the upper to 5 mm long, broad, 3-nerved in lower part; lemmas to 7 mm long, very obscurely nerved, convolute, flattened toward the summit, scaberulous on the nerves below, ciliate on the margin, narrowly membranaceous, prolonged into a scabrous awn to 2 mm long, terete-linear in fruit; palea as long as the lemma, shallowly bidentate, glabrous or scabrous toward the summit; anthers purple or yellow, ca. 3 mm long; ligule hairy at the top. July-August.

Glacial moraines and alpine meadows. -Caucasus: Ciscauc., West. Transcauc. Gen. Distr.: Lazistan (Turkey). Described from Dzhimilia. Type in Geneva.

Subgenus 2. PHAECHLOA Griseb. Spicil. Fl. Rum. II (1844)
433. Plants with mixed intravaginal and extravaginal shoots, forming rather dense tufts. Leaves 2-3 mm broad, usually involute or folded, oval or polygonal in section. Inflorescence spreading; spikelets remote on rather smooth branches, purple or variegated. Lemmas lanceolate, keeled, acute, awnless or with a very short awn. Lodicules subemarginate, ciliate. Ovary usually hairy at the top. Caryopsis oblong, free.

NOTE. Since many species of this subgenus occur outside the Soviet Union, classification into series has been omitted in this case; if such a classification had been attempted, most of the series would be monotypic.

1. Ovary and caryopsis glabrous at the top 2.
- + Ovary and caryopsis hairy at the top 4.
2. Dwarf plants of high mountains, with falcate short leaves, forming flattened tufts; inflorescence containing 3-5 spikelets; glumes sub-obtuse, broad; lemmas 6 mm long, nearly awnless; anthers to 3 mm long (Pamiro-Alai). 43. *F. amblyodes* V. Krecz. et Bobr.
- + Large mountainous plants, with long, smooth sheaths, long leaves, and inflorescences containing numerous spikelets; glumes acuminate; lemmas 6-9 mm long; anthers 4 mm long 3.
3. Glumes 4-5 mm long. Lemmas narrowly lanceolate, smooth, 6.5 mm long, scarious toward the summit, obscurely nerved 41. *F. alata* (Hack.) Roshev.
- + Glumes 5-5.5 and 6.5-7 mm long, respectively; lemmas lanceolate, scabrous, 8-9 mm long, brownish-yellow toward the summit 42. *F. altaica* Trin.
4. Anthers at most 0.5 mm long. Lemmas scabrous, 4.5-5 mm long 40. *F. venusta* St.-Yves.
- + Anthers 3-4 mm long. Lemmas scabrous only toward the summit, 5-6 mm long 5.
5. Sheaths smooth or scabrous; leaves not pilose 6.
6. Glumes obtuse or subobtuse. Glumes stramineous, purple-tinged; anthers 3 mm long 36. *F. varia* Haenke
- + Glumes mucronate. Spikelets purple; anthers 4 mm long 7.
7. Leaves folded, soft. Inflorescence broadly spreading; spikelets 5-8-flowered; glumes 3.5-4 and 4-4.5 mm long 37. *F. tianschanica* Roshev.
- + Leaves setaceous-involute, scabrous, rather stiff. Inflorescence short; spikelets 2-3-flowered; glumes 4-4.5 and 5-6 mm long 38. *F. tristis* Kryl. et Ivanitz.

36. *F. varia* Haenke in Jacq. Collect. (1788) 94; Grossg. Fl. Kavk. (Grossh. Fl. Cauc.) I 116. -*F. Woronovii* Hack. in Monit. Jard. de Tifl. 24 (1912) 18; Grossg., l. c. 116.

Perennial. Loosely tufted; culms 40-70 cm tall, glabrous, smooth, covered below with glabrous, smooth sheaths; leaves erect, terete, involute, smooth, stiff, 0.7 mm in diam. to 20 cm long, those of the culm to 8 cm long. Panicle to 10 cm long, rather open, nodding, with rather scabrous branches; spikelets elliptical, usually purplish, 4-6-flowered, 8-10 mm long; glumes unequal, the lower 3-4 mm long, 1-nerved, the upper ca. 5 mm long, 3-nerved, subacute or subobtusate, smooth or pubescent at the summit; lemmas 4.5-6 mm long, lanceolate, acuminate, sometimes weakly awned, glabrous or scaberulous near the summit; pales minutely bidentate, ciliate on the keel; anthers to 3 mm long. June-August. (Plate XXXIX, Figure 7 a-f).

Subalpine and alpine meadows. -Caucasus: Ciscauc., Dag., West., South., and East. Transcauc. Gen. Distr.: West. Medit., Centr. Eur., Balk. -Asia Min., Arm. -Kurd. Described from Austria.

ECONOMIC IMPORTANCE. Readily eaten by livestock only before flowering.

37. *F. tianschanica* Roshev. sp. nova in Addenda p. 772.

Perennial. Rhizome short-creeping, often forming dense tufts; culms slender, smooth, 20-70 cm tall; leaves narrowly linear, to 2 mm broad, soft, folded, smooth on the outside; sheaths rather scabrous, fairly long; ligule very short. Panicle few-flowered, rather broadly open, 8-20 cm long, with slender branches to 10 cm long; spikelets narrowly lanceolate, 7-12 mm long, 5-8-flowered, light purple; glumes acute, more or less mucronate, the lower narrowly lanceolate, 3.5-4 mm long, the upper lanceolate, 4-4.5 mm long; lemmas entirely smooth, 6 mm long, lustrous, scarious toward the summit, prominently nerved, acuminate, or with awn to 1.5 mm long, more rarely subobtusate (var. *submutica* Roshev.); anthers 4 mm long. June-August. (Plate XXXIX, Figure 6 a-f).

527 Alpine and subalpine zone, meadows and slopes. -Centr. Asia: Syr-Dar., Pam., -Al., Tien Shan. Gen. Distr.: Ind. -Him., Dzung. -Kashg. Described from Tien Shan. Type in Leningrad.

38. *F. tristis* Kryl. et Ivanitzk. in Animad. syst. Herb. Univ. Tomsk. No 1 (1928). -*F. sajanensis* Roshev. in Bull. Jard. Bot. URSS. XXXVIII (1929) 383.

Perennial. Tufted; culms slender, smooth, 20-50 cm tall; leaves narrowly linear, 0.6-1.5 mm broad, setaceous-folded, polygonal in section, scabrous, the basal leaves not exceeding half the length of the culms; sheaths rather smooth; ligule obsolete. Panicle small, 5-7 cm long, few-flowered, loose, with smooth branches to 4 cm long; spikelets elliptical, 5-8 mm long, 2-3-flowered, blackish-purple; glumes narrowly lanceolate, more or less mucronate, the lower 4.5-5 mm long, the upper 5-6 mm long; lemmas nearly smooth, keeled, 6-6.5 mm long, rather faintly nerved, tapering into awn 1-1.5 mm long; anthers ca. 4 mm long. July-August. (Plate XXXIX, Figure 4 a-f).

Meadows and stone drifts in the alpine zone, and in moss-lichen tundra. -West. Siberia: Alt.; East. Siberia: Ang. -Sayan. Gen. Distr.: Mongolia. Described from Kotton-Karagai (southwestern Altai). Type in Tomsk.

39. *F. cretacea* Czern. in herb. inedit. - *F. rubra* ssp. *cretacea* Lavr. in Not. syst. Herb. Horti Petr. III, 2 (1922) 5. - *F. Issatchenkoi* St. - Yves, ined.

Perennial. Rigid, grayish-green plants with creeping rhizomes, forming loose tufts. Culms terete, smooth, 40-60 cm tall. Leaves stiff, straight or flaccid, with mid-vein very prominent on the lower side, subinvolute, to 2 mm broad, hirsute on the upper side, smooth on the lower side, abruptly pointed; sheaths copiously covered with short hairs, the lower ones pinkish-brown. Panicle oblong, contracted, to 8-10 cm long. Spikelets oblong, grayish-green, tinged with purple, 0.7-0.8 cm long, 4-7-flowered; glumes narrowly lanceolate, the lower subacute, 2-2.5 mm long, the upper subobtusate, 4-4.5 mm long; lemmas 5-5.5 mm long, rather scabrous toward the summit, short-awned or acuminate; palea somewhat shorter, ciliate on the margin, scabrous on the back. Anthers to 3 mm long. Ovary setose at the top; caryopsis free. May-June. (Plate XXXIX, Figure 5 a-f).

Shoals. - European part: Volg. - Don (western part), Low. Don (northern part). Endemic. Described from Starobel'skii Raion of Khar'kov Guberniya. Type in Khar'kov.

40. *F. venusta* St. - Yves. in Bull. Jard. Bot. URSS, XXVIII (1929) 383.

528 Perennial. Rhizome creeping; tufted; shoots mixed; culms slender, smooth, 20-25 cm long; sheaths smooth; leaves flat or subinvolute, 2-2.5 mm broad, smooth on the outside, short. Panicle loose, somewhat nodding, 5-7 cm long, with slender, flexuous branches; spikelets oblong, purple, 6-7 mm long, 3-4-flowered; glumes subobtusate, the lower lanceolate, 2 mm long, the upper broadly lanceolate, 3 mm long; lemma 4.5-5 mm long, lanceolate, keeled, obscurely nerved, scabrous, especially on the margin and toward the summit; anthers 0.6 mm long. June-July.

Wet places, meadows. - East. Siberia: Daur. (Achinskii Raion, at the sources of the river Kukun, V. I. Smirnov). Gen. Distr.: Mongolia. Described from Mongolia: Khangai, Sani-Gegen. Type in Leningrad.

41. *F. alata* Hack. Roshev. comb. nova. - *Festuca violacea* var. *alata* Hack. in herb. - *F. rubra* ssp. *alata* St. - Yves in Candollea III (1929) 393.

Perennial. Grayish-green plants; rhizome short-creeping, forming dense tufts; culms smooth, 50-60 cm tall; leaves narrowly linear, to 3 mm broad, flat or subinvolute, smooth underneath, scabrous on the upper surface; ligule very short. Panicle to 12 cm long, loose, the rather smooth branches to 8 cm long; spikelets 10-12 mm long, 4-flowered, purple; glumes narrowly lanceolate, the lower 4 mm, the upper 5 mm long; lemmas glabrous, 6-6.5 mm long, smooth, narrowly lanceolate, acuminate or prolonged into awn 1-1.5 mm long, light purple, scarious toward the summit, obscurely nerved; anthers to 4 mm long. July.

Centr. Asia: Tien Shan (Kungei-Alatau: Kokoirok, at the sources of B. Kebin, in the alpine zone - Broterus). Endemic. Type in Helsinki.

42. *F. altaica* Trin. in Ldb. Fl. alt. I (1829) 109; Griseb. in Ldb. Fl. Ross. IV, 354; Turcz. Fl. baic.-dah. II, 341. - *Festuca nervosa* Turcz. in herb. Ldb. - Ic.: Ldb. Ic. Fl. Ross. (1831) tab. 288.

Perennial. Rhizomes short, forming compact tufts; culms smooth, 25-100 cm tall; leaves narrowly linear, to 2-2.5 mm broad, folded, rather

stiff, more or less scabrous; ligule short, ciliate. Panicle few-flowered, rather open, 7-12 cm long; spikelets lanceolate, 8-12 mm long, 2-5-flowered; glumes broadly lanceolate, acuminate, the lower 5-5.5 mm, the upper 6.5-7 mm long; lemmas lanceolate, scabrous all over the surface, prominently 5-nerved, 8-9 mm long, acuminate or very short-awned, purple, rusty-brown; anthers to 4 mm long. June-August.

Mountainous tundra, dry slopes, stony sites, and dry, thin forests. - Arctic: Chuk., Anad.; West. Siberia: Ob' region, Irt., Alt.; East. Siberia: all regions; Far East: Kamch., Okhot. Gen. Distr.: Mong., North America. Described from Altai. Type in Leningrad.

- 529 43. *F. amblyodes* V. Krecz. et Bobr. sp. nova. in Addenda p. 771.
-*F. violacea* var. *kaschmiriana* Hack. in Fech. Flora pamira (Flora of Pamir) (1903) 206.

Perennial. Forming compact, flattened tufts; culms to 15 cm tall, smooth, loosely covered below with light-colored sheaths, the blades to 3 cm long, folded, short-acuminate, scabrous on the upper surface; innovations densely transversely enveloped by wrinkled, often fibrillose, reddish-brown sheaths; leaves of innovations 5-6 cm long, stiff, glaucous, falcate, scabrous. Panicle few-flowered, open in anthesis, contracted, 2-4 cm long, its axis and branches scaberulous; spikelets with smooth rachilla, crowded at first, later spreading, oblong-ovoid, 8-12 mm long, 4-6-flowered; glumes subobtusate, faintly keeled, purple, green on the back, crenulate on the margin, the upper to 4 mm long, oblong-ovate, with obscure marginal nerves, abruptly terminating in a blunt tip, the lower lanceolate, 2.5-3 mm long; lemmas ovate-lanceolate, obscurely 5-nerved, 5-6 mm long, with a faint, scabrous keel in upper part, subobtusate, sometimes with awn to 1 mm long, purple, membranaceous-margined near the summit, crenulate, the upper lanceolate, bidentate, scabrous on the nerves toward the summit; anthers linear, to 3 mm long. August-September. (Plate XXXIX, Figure 8 a-f).

Centr. Asia: Pam. -Al. Endemic. Described from the Trans-Alai Range, southern slope of Kizyl-art. Type in Leningrad.

Subgenus 3. *SCHEDONORUS* (P. B.) Aschr. Fl. Brand. I (1864) 853; P. B. Agrostogr. (1812) 99 pp.; *Festuca* Sect. *Bovinae* Fr. in Andersa. Skand. Vaxt. II (1852) 18, ex p. -Leaves flat, linear, 3-5 (6) mm broad; ligule short, often obsolete, reduced to a narrow, toothed fringe. Spikelets oblong-lanceolate or oblong-elliptical, with appressed, imbricate florets; lemmas broadly lanceolate, 6-9 mm long, with strongly inrolled margins and rather prominent nerves and keel. Anthers 3-4 mm long. Lodicules equal, acute, bifid. Ovary obovoid, glabrous, lopsided, with 2 plumose stigmas. Caryopsis oblong or oblong-obovoid, convex on the back, broadly grooved on the front, fused to lemma and palea, hilum extending down nearly the entire length of the grain.

1. Inflorescence narrowly paniculate, few-flowered, the lowest branch bearing 2-3 spikelets; glumes obtuse or subobtusate; lemmas obscurely keeled and nerved, obtuse or subobtusate (in the Caucasus acute or even mucronate); anthers to 3 mm long. Leaves 3-4 (5) mm broad
..... 44. *F. pratensis* Huds.

+ Inflorescence many-flowered, or with reduced, fasciculate branches, or spreading, the lowest branch bearing 3-8 spikelets; glumes acute,

- lemmas acute, prominently nerved and keeled; anthers 4-4.5 mm long. Leaves 5-8 mm broad 2.
- 530 2. Inflorescence branches reduced in length, spikelet-bearing down to the base, hence panicle dense and narrow, spiciform; lemmas scabrous all over the surface 47. *F. Fenas* Lag.
- + Inflorescence branches long, spikelet-bearing on the terminal part; inflorescence open-paniculate; lemmas scaberulous only toward the summit 3.
3. Lemmas awnless, 8-9 mm long, nerves on the upper glume not coalescent; spikelets yellowish-green or purplish-green 45. *F. arundinacea* Schreb.
- + Lemmas short-awned from below the tip, 7-8 mm long; nerves on the upper glume coalescent toward the summit; spikelets glaucous-green or pinkish-green 46. *F. orientalis* Kerner.

Series 1. *Aphanoneuræ* V. Krecz. et Bobr. -Glumes and lemmas mostly obtuse or subobtuse, with obscure nerves and obsolete keel. Anthers to 3 mm long. Inflorescence few-flowered (lowest branches bearing 1-3 spikelets).

44. *F. pratensis* Huds. Fl. angl. ed. I (1762) 37. -*F. elatior* L. Spl. pl. (1753) 75, pro parte. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 70, fig. 1565.

Perennial. Culms 30-100 cm tall; leaves narrowly linear, scaberulous on the margin, 3-5 (6) mm broad; panicle to 20 cm long, rather 1-sided, contracted, somewhat open only in anthesis, branches reduced in length, the shortest among the lower branches bearing 1-2 spikelets; spikelets green or faintly purple, linear-oblong, to 15 mm long, 3-10-flowered; glumes subobtuse, smooth, hyaline-margined, the upper 3.5-4.5 mm long, ovate-lanceolate or lanceolate, the lower lanceolate, 2-3 mm long; lemmas oblong-obovate, convex, subobtuse or rounded-subobtuse, broadly membranaceous-margined toward the summit, smooth, obscurely 5-nerved, the mid-nerve not reaching the tip, 5-7 mm long; palea elliptical-lanceolate, sparsely scabrous on upper 2/3 of the keels, about as long as the lemma; anthers linear, ca. 3 mm long. May-July. (Plate XXXIX, Figure 9 a-f).

Meadows, forest margins, light forests. -European part: Kar. -Lap., Lad. -Il'm., Dv. -Pech., Upp. Dnepr., Upp. Volg., Volg. -Kam., Mid. Dnepr., Volg. -Don, Zavolzh., Prichern.; Caucasus: Ciscauc., Dag., West., South, and East. Transcauc.; West Siberia: Ob' region, Yenisei. Upp. Tob., Irt., Alt., East. Siberia: Yenisei., Ang. -Sayan.; Far East: Sakhal. (introduced), Ussur. (introduced); Centr. Asia: Upp. Turkm., Pam. -Al., Tien Shan. Gen. Distr.: West. Eur., Asia Minor. Described from England. Type in London.

- 531 **ECONOMIC IMPORTANCE.** Meadow fescue is a valuable forage plant of meadows in the forest zone and partly in the forest-steppe zone of the Union. A long-lived plant. Makes good recovery growth after grazing, stands up to trampling by livestock, and is distinguished by high nutritive value. One of the best plants in mixtures for pasturage and for hay-making. It is advisable to cut it at the beginning of flowering; in years favored by much rainfall, it furnishes a second cutting; yields 3-4 tons per hectare, seed harvest about 300 kg per hectare. It surpasses timothy in fodder quality. Oriental fescue (see below) is of less importance.

Series 2. *Phaneroneura* V. Krecz. et Bobr. -Glumes and lemmas acute, with prominent nerves, keeled. Anthers 4-4.5 mm long. Inflorescence many-flowered (lowest branches bearing 3-8 spikelets).

45. *F. arundinacea* Schreb. Specil. Fl. Lips. (1771) 57. -*F. littoralis* Wahlb. Nov. Act. Ups. VIII (1821) 211, 233. -*Id.*: Rechb. Ic. Fl. Germ. I, tab. 70, fig. 1568. -*Exs.*: HFR No 396.

Perennial. Culms 50-150 cm tall; leaves to 7 mm broad; panicle to 3 cm long, open, branches long; spikelets ovate, 1.5-1.8 cm long, mostly light purple; glumes long-acuminate, keeled, smooth, the upper 6-7 mm long, narrowly lanceolate, the lower 5-6 mm long, subulate-lanceolate; lemmas lanceolate, faintly keeled, 8-9 mm long, membranaceous toward the summit, subacute, 5-nerved, the midnerve and the marginal nerves more pronounced, the margins inrolled, nerves in upper part and margin scabrous owing to antrorse bristles; palea lanceolate, scabrous on the upper 2/3 of the nerves; anthers linear, 4-4.5 mm long. July-August. (Plate XXXIX, Figure 10 a-f).

European part: Baltic seaboard; in the U.S.S.R.: Lad. -D'm.: Leningrad (Krestovskii Island, Lakhta). Gen. Distr.: West. Europe, principally along the Atlantic seaboard. Described from the surroundings of Leipzig. Type in Munich.

ECONOMIC IMPORTANCE. A pasture and hay-producing plant, approaching *F. pratensis* in fodder quality. It is most desirable to test it more thoroughly under cultivation in the conditions of the U.S.S.R. According to the few trials carried out by the Forage Institute it gives higher yields than *F. pratensis*.

46. *F. orientalis* Kerner ex Hack. Monogr. Fest. (1882) 154, sub var. ϕ . -*F. arundinacea* Griseb. in Ldb. Fl. Ross. 357 et auct. Fl. Ross. -*F. arundinacea* var. *orientalis* Hack., l. c.; Grossg. Fl. Kavk. (Grossh. Fl. Cauc.) II, 118.

Perennial. Culms 30-100 cm tall; leaves to 7 mm broad, flat or sub-involute; panicle to 20 cm long, somewhat contracted and 1-sided; spikelets oblong-ovate, 12-15 mm long, mostly light-colored or purple-tinged; glumes long-acuminate, keeled, more or less awned, scabrous on the keel, the upper 5-6 mm long, narrowly lanceolate, with 3 nerves coalescent at the summit, the lower 4-5 mm long, subulate-lanceolate; lemmas oblong-lanceolate, more or less inrolled at the margins, faintly keeled, 7-8 mm long, mostly furnished with a scabrous awn to 2-3 mm long, with 5 nerves, 532 of which only 3 are distinct, rather scabrous at the summit and on the nerves, smooth on the margin; palea oblong-lanceolate, scabrous on the upper 2/3; anthers linear, ca. 4 mm long. May-July. (Plate XXXIX, Figure 11 a-f).

Solonchets and wet meadows. -European part: Upp. Dnepr., Mid. Dnepr., Prichern., Volg. -Don, Zavolzh., Volg. -Kam. (south), Low. Don, Low. Volg., Crimea; West. Siberia: Upp. Tob., Irt. (south), Alt. (Teletskoe Lake); Caucasus: Ciscauc., Dag.; Centr. Asia: Aral. -Casp., Pribalkh., Kyz. -Kum, Tien Shan, Dzung. -Tarb., Upp. Turkm. (Firyuza), Amu-Dar., Pam. -Al. Gen. Distr.: Hungary, Czechoslovakia, Romania. Described from Hungary.

47. *F. Fenas* Lag. Gen. (1816) 4. -*F. elatior* subsp. *arundinacea* var. *Fenas* Hack. Monogr. Fest. (1882) 156. -*Exs.*: Heldr. Herb. Gr. norm. No 1094.

Perennial. Culms 60-100 cm tall, rigid, smooth, shining; sheath smooth, lustrous; leaves to 7 mm broad, flat, involute toward the apex, stiff, costate; panicle to 20 cm long, narrow, erect, dense, with shortened branches, spikelet-bearing down to the base; spikelets dense, 4-6-flowered, elliptical, to 10 mm long, pale; glumes lanceolate, subacute, prominently nerved, the upper ca. 5 mm long, the lower ca. 4 mm long; lemmas lanceolate, 5-7 mm long, subacute, minutely scaberulous on the margin and toward the summit, the mid-nerve prominent and scabrous above; palea as long as the lemma; anthers linear, 4 mm long. May-July.

Solonchets and wet meadows. -European part: Prichern. (Aleshkil), Crimea; Caucasus; Ciscauc., South, and East. Transcauc. Gen. Distr.: Mediterranean. Described from Spain. Type in Madrid.

NOTE. In the Caucasus a distinct race of this species can apparently be distinguished.

Subgenus 4. *DRYMANTHELE* V. Krecz. et Bobr. -Culm bases and rhizomes covered with squamaceous sheaths. Leaves flat; ligule truncate; auricles lacking. Spikelets elliptical, loosely flowered, flat, with subdivaricate florets. Lemmas lanceolate, terete, with inrolled margins, ca. 5 mm long, acute, awnless or faintly awned, prominently 5-nerved. Anthers 2.5-3.5 mm long. Ovary oblong-obovoid, lopsided, hairy on the top. Caryopsis oblong, free or nearly so, flat or subconcave on the front; hilum half the length of grain.

1. Plants with long, creeping rhizomes. Leaves to 12 mm broad. Lemmas glabrous 48. *F. montana* MB.
- + Plants with short rhizomes, tufted. Leaves to 15-16 mm broad. Lemmas sparsely short-pilose 49. *F. silvatica* (Poll.) Vill.

48. *F. montana* M. B. Fl. taur.-cauc. III (1819) 75. -*F. Drymeja* 533 Griseb. in Ldb. Fl. Ross. IV, 355; Grossg. Fl. Kavk. (Grossh. Fl. Caucas.) I, 118.

Perennial. Culms 70-150 cm tall; rhizomes long-creeping; lower sheaths squamaceous; ligule fimbriate; leaves to 12 mm broad, long, long-acuminate, multicostate, hispid on the upper surface and on the margin. Panicle to 25 cm long, broadly spreading, with long, capillary, scabrous branches; spikelets borne at the ends of branches, elliptical-lanceolate, 4-6-flowered, to 7 mm long, pale green; glumes narrowly lanceolate, acuminate, membranaceous on the margin, the upper 3.5-4 mm, the lower 2.5-3 mm long; lemmas ca. 5 mm long, linear-lanceolate, acuminate, subcarinate, glabrous on the back, smooth; anthers linear, 3-3.5 mm long. June-July.

Shady forests. -Caucasus: Ciscauc., Dag., West. and East. Transcauc., Tal. Gen. Distr.: northern Persia. Described from the Caucasus. Type in Leningrad.

ECONOMIC IMPORTANCE. A satisfactory grass for grazing and for hay, furnishing fodder of high quality.

49. *F. silvatica* (Poll.) Vill. Hist. Pl. Dauph. II (1787) 105; Griseb. in Ldb. Fl. Ross. IV, 355. -*Poa silvatica* Poll. Palat. I (1776) 83. - Ic.: Rehb. Ic. Fl. Germ. I, tab. 68, fig. 1562. -Exs.: HFR No 546.

Perennial. Culms 90-150 cm tall; rhizomes short; sheaths scabrous, the lower ones squamaceous; leaves 10-16 mm broad, flat, acuminate, very scabrous on the margin. Panicle erect, open, to 20 cm long, branches

slender, long, scabrous, subhorizontal; spikelets light green, elliptical, 2-5-flowered; glumes lanceolate, acute, the upper longer than the lower, 3.5-4.5 mm long; lemmas linear-lanceolate, 5-6 mm long, distinctly nerved; palea as long as the lemma, both densely short-pubescent; anthers 2.5-3 mm long. May-July. (Plate XL, Figure 25 a-f).

Shady, mostly deciduous, forests. -European part: Lad. -Il'm. (west), Upp. Dnepr., Upp. Volg., Volg. -Don (Zheguli), Low. Don (Saratov), Volg. -Kam. (south), Zavolz.; Caucasus: Ciscauc. (Stavropol', Teberda); West. Siberia: Alt. Gen. Distr.: West. Europe, Asia Minor. Described from Hungary.

Subgenus 5. DRYMONAETES (Ehrh.) V. Krecz. et Bobr.; Ehrh. in Beitr. IV (1759) 147, nom. sol. -Large plants with extravaginal offshoots. Culms terete, sulcate, 3-5-noded, leafy up to the inflorescence. Leaves with falcate amplexicaul auricles; ligule short, truncate. Spikelets oblong-lanceolate, with appressed, imbricate florets. Lemmas lanceolate, keeled, prominently 5-nerved, rather scabrous, faintly bidentate, with a slender, 534 long awn. Lodicules large, deeply bilobed, the lobes unequal; anthers to 2 mm long. Ovary obovoid, furrowed at the top and on the sides. Caryopsis fused to lemma and palea, oblong-obovoid, with a broad shallow groove on the front, hyaline-fringed at the top, narrow; hilum extending the entire length of the grain.

1. Spikelets to 15 mm long. Lemmas 6-8 mm long, with awn twice as long; anthers to 2 mm long 50. *F. gigantea* (L.) Vill.
- + Spikelets to 7-8 mm long. Lemmas 4-6 mm long, with awn of same length; anthers ca. 1 mm long. 51. *F. extremiorientalis* Ohwi.

50. *F. gigantea* (L.) Vill. Hist. pl. Dauph. II (1787) 110; Griseb. in Ldb. Fl. Ross. IV, 354. -*Bromus giganteus* L. Sp. pl. (1753) 177. -Lc.: Rchb. Ic. Fl. Germ. I, tab. 76, fig. 1802; Syr. Illustr. Fl. Mosk. (Illustrations to the Flora of Moscow) I, 149. -Exs.: Herb. Fl. Cauc. No 302.

Annual. Culms 50-170 cm tall; leaf sheaths rather scabrous; leaves broadly linear, scabrous on the margin, scattered-pilose, 7-15 mm broad; ligule ca. 1 mm long. Panicle 15-30 cm long, loose, nodding, open, with long, very scabrous branches; spikelets pale-green, lanceolate, 3-5 (7)-flowered, to 15 mm long; glumes lanceolate, acuminate, 5-7 mm long, the lower somewhat shorter than the upper; lemmas lanceolate, scabrous toward the summit, 6-8 mm long, the flexuous and scabrous awn attached slightly below the summit, 10-16 mm long, often twice as long as its lemma. Caryopsis to 5 mm long; anthers ca. 2 mm long. June-August. (Plate XL, Figure 23 a-d).

Shady forests, coppices, and tall-grass mountain meadows. -European part: Kar. -Lap., Lad. -Il'm., Dv. -Pech., Upp. Dnepr., Upp. Volg., Volg. -Kam., Mid. Dnepr., Volg. -Don, Zavolz., Prichern., Low. Don Low. Volg., Crimea; Caucasus: Ciscauc., Dag., West., South. and East. Transcauc., Tal.; West. Siberia: Upp. Tob., Ob' region, Irt., Alt.; East. Siberia: Yenisei, Ang.-Sayan; Centr. Asia: Tien Shan, Dzung. -Tarb. Gen. Distr.: western Europe. Described from France (Dauphine). Type in London.

51. *F. extremiorientalis* Ohwi in Bot. Mag. Tokio XLV (1931) 194. -*F. gigantea* auct. fl. orienti. extr.

Perennial. Culms 50-120 cm tall; sheaths rather scabrous; leaves linear-lanceolate, to 12 mm broad, rather scabrous on both sides, sometimes scattered-pilose; panicle 20-30 cm long, open, nodding, with scabrous branches; spikelets 5-7 mm long, lanceolate, 4-5-flowered; glumes narrowly lanceolate, acuminate, the lower subulate-lanceolate, ca. 3 mm long, the upper lanceolate, 4.5-5 mm long, both scabrous toward the summit; lemmas lanceolate, 4-6 mm long, acute, scabrous above on the mid-nerve and margin, the straight, scabrous awn, 4-5 mm long, exceeding its lemma; caryopsis 3 mm long; anthers ca. 1 mm long. June-July. (Plate XL, Figure 24 a-e).

- 535 Forests and coppices. -East, Siberia: Daur.; Far East: Ze. -Bur., Uda region, Sakh., Ussur. Gen. Distr.: Manchuria, Korea. Described from Korea. Type in Tokyo.

Genus 180. VULPIA* GMEL.**

Gmel. Fl. Bad. I (1806) 8.

Fairly large plants, with a paniculate or spikelike inflorescence, the inflorescence always branching at the base. Spikelets borne on short or fairly long pedicels, ranked, 4-8-flowered. Glumes narrowly lanceolate, acute, markedly unequal, the lower 1-nerved, the upper 3-nerved; lemmas narrowly lanceolate, convex, to 7 mm long, rather distinctly 5-nerved, gradually tapering into an awn, the awn mostly longer than its lemma. Paleas lanceolate, bidentate, ciliate on the keels. Stamen solitary, with broadly elliptical anthers, to 1 mm long. Pistil short. Annual plants.

1. Spikelets borne on pedicels ca. 0.5 mm long, subsessile. (Plate XLI, Figure 3) 2.
- + Spikelets borne on pedicels to 2.5 mm long. (Plate XLI, Figures 4 and 5) 3.
2. Lemmas scabrous (sometimes pilose, and then not long-ciliate on the margin); robust plants with erect, spikelike inflorescence; lower glume 1/3-1/2 as long as the upper 1. *V. persica* (Boiss. et Buhse) V. Krecz. et Bobr.
- + Lemmas pilose, long-ciliate on the margin; slender plants, with a weak, loosely-flowered inflorescence; lower glume 1/6-1/5 as long as the upper 2. *V. ciliata* (Danth.) Link.
3. Lower glume 1/4-1/3 as long as the upper; spikelets 4-5-flowered; lemmas scabrous above, the awn 2-3 times the length of its lemma 3. *V. myuros* (L.) Gmel.
- + Lower glume at least 1/2 as long as the upper; spikelets 6-8-flowered; lemmas scabrous all over, the awn as long as its lemma or slightly longer 4. *V. dertonensis* (All.) Volkart.

* Named for J. S. Vulpus (1760-1846), pharmacist, who studied the flora of Baden.

** Compiled by V. I. Kreschetovich and E. G. Bobrov.

1. *V. persica* (Boiss. et Buhse) V. Krecz. et Bobr. comb. nov. - *Nardurus persicus* Boiss. et Buhse. Aufz. (1860) 225; Boiss. Fl. Or. V, 632. - *Festuca maritima* auct. fl. Turk., non L.
- 536 Annual. Culms erect, geniculate at the base, smooth, 10-25 cm long; leaves narrow, folded, linear, the sheaths investing the lower part of the panicle. Panicle erect, strongly contracted, spiciform at the top (with 1 or 2 appressed branches at the base), 2-ranked; spikelets borne on short pedicels (up to 0.5 mm in length), loose, 3-5-flowered; glumes unequal, acute, lanceolate, the upper 3-4 mm long, 3-nerved, the lower 1/3-1/2 as long; lemmas lanceolate, scabrous all over, prolonged into a scabrous awn of same length or longer, obscurely 5-nerved; anthers oblong-elliptical, to 1 mm long. April-May.
- Submontane deserts, mountain slopes; occasionally as a weed (in towns). - Caucasus: South. and East. Transcauc.; Centr. Asia: Upp. Turkm., Tyan-Shan (west), Pam.-Al. (west). Gen. Distr.: Arm.-Kurd., Iran. Described from eastern Persia (Bunegu). Type in Geneva.
2. *V. ciliata* (Danth.) Link. Herb. Berol. 1 (1827) 147; Griseb. in Ldb. Fl. Ross. IV, 349. - *Festuca ciliata* Danth. ex Lam. et DC. Fl. Fr. III (1805) 55. - *F. Danthonii* Asch. et Gr. Syn. II (1901) 550. - *F. exigua* Litw. in Trav. Mus. Bot. St. Pétersb. I, 1 (1902) 20. - Ic.: Rchb. Ic. Fl. Germ. I tab. 50, fig. 1524. - Exs.: HFR No 547.
- Annual. Green, tufted plants; culms slender, geniculate, ascending, often weak at the top, 5-30 cm tall; leaves slender, involute. Panicle enveloped at the base by leaf sheaths, nodding or reflexed, 5-15 mm long; spikelets dense, 4-6-flowered, compressed, borne on short pedicels (ca. 0.5 mm in length); glumes lanceolate, acute, unequal, the upper 3-nerved, to 3 mm long, the lower 1-nerved, 1/7-1/5 as long, subsquamaceous (0.5 mm long); lemmas narrowly linear-lanceolate, long-ciliate on the margin, with scattered short hairs on the back, the awn as long as its lemma or longer; anthers 5 mm long. April-May.
- Dry river-beds, canal and river banks, lower mountain levels. - Europe: an part: Crimea; Caucasus: Dag., East. and South. Transcauc.; Centr. Asia: Upp. Turkm., Pam.-Al. (west). Gen. Distr.: Medit., Asia Min., Iran. Described from France.

Explanation to Plate XLII

1. *Lottolium orientale* (Boiss.) V. Krecz. et Bobr.: a) view of inflorescence from two sides; b) attachment of glumes to rachilla; c) lemma from the inside; d) lower and upper glume; e) palea with stamen; f) lemma in side view. - 2. *Nardurus tenuiflorus* (Schrad.) Boiss.: a) inflorescence; b) attachment of glumes to rachilla; c) lower and upper glume; d) lemma in side and front view; e) palea. - 3. *Vulpia persica* (Boiss. et Buhse) V. Krecz. et Bobr.: a) inflorescence; b) attachment of glumes to rachilla; c) lower and upper glume; d) lemma in side and front view; e) palea. - 4. *Vulpia myuros* (L.) Gmel.: a) inflorescence; b) attachment of glumes to rachilla; c) lower and upper glume; e) palea with stamen. - 5. *Vulpia dertonensis* (All.) Volkart: a) inflorescence; b) attachment of glumes to rachilla; c) lower and upper glume; d) lemma in dorsal and side view; e) palea with stamen. - 6. *Scleropoa Woronowii* Hack.: a) inflorescence; b) glumes in side view; c) glumes in frontal view; d) lemma in front and side view; e) palea. - 7. *S. rigida* (L.) Griseb.: a) inflorescence; b) glumes in side view; c) glumes in front view; d) lemma in front and side view; e) palea. - 8. *S. rigescens* (Trin.) Griseb.: a) inflorescence; b) glumes in side view; c) glumes in front view; d) lemma in front and side view; e) palea.



- 539 3. *V. myuros* (L.) Gmel. Fl. Bad. I (1806) 8. - *Festuca Myuros* L. Sp. pl. (1753) 74. - *F. linearis* Gilib. Exerc. phytol. II (1792) 534. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 60, fig. 1525. - Exs.: Fl. cauc. exs. No 2.

Annual. Culms erect or ascending, smooth, enveloped by sheaths nearly to the top, 20-40 cm tall. Leaves involute-setaceous, soft. Panicle elongate, narrow, with appressed branches, often 1-sided, nodding, to 25 cm long; spikelets 4-5-flowered, loose, compressed, with smooth rachilla, borne on a pedicel to 2.5 mm long; glumes linear-lanceolate, slender, acute, keeled, scabrous, the upper 3-nerved, to 5 mm long, the lower $1/4-1/3$ as long; lemmas narrowly linear-lanceolate, to 7 mm long, 5-nerved, scaberulous above and gradually tapering into an awn, 2-3 times as long; anthers 0.3 mm long, broadly elliptical, persistent. April-May. (Plate XLI, Figure 4 a-e).

Dry slopes; often as a weed (among crops and in gardens). - European part: Low. Volg. (Novouzenskii Raion - introduced?); Crimea; Caucasus: Ciscauc., Dag., East. and South. Transcauc., Tal.; Centr. Asia: Mount. Turkm., Pam. - Al. (west). Gen. Distr.: West. Eur., Asia Min., Centr. Asia, North Africa. Described from Baden, Karlsruhe. Type in London.

4. *V. dertonensis* (All.) Volkart, ex Schinz et Keller Fl. Schweiz. ed. 2 (1905) 57. - *Bromus dertonensis* All. Fl. ped. II (1785) 249. - *Festuca dertonensis* Asch. et Gr. Syn. II (1900) 559; Grossg. Fl. Kavk. (Grossg. Fl. Cauc.) I, 119. - *Vulpia sciuroides* Boiss. Fl. Or. V (1884) 628, non Gmel. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 60, fig. 1529. - Exs.: HFR No 1748, Fl. Cauc. exs. No 55.

Annual. Culms 15-30 cm tall, more robust, panicle short, strongly contracted, 6-10 cm long, erect, sometimes subspiciform; spikelets borne on elongate pedicels, to 2 mm long, (4) 6-8-flowered, with a slender, scabrous rachilla; glumes 6-7 mm long, the lower glume 1-nerved, at least $1/2$ the length of the upper (ca. 4 mm long); lemma and palea scabrous, awn slightly longer than its lemma; anthers to 0.3-0.4 mm long. May-June. (Plate XLI, Figure 5 a-e).

A weed. On maritime mountain slopes. - Caucasus: West. Transcauc. (Sochi, Sukhum, Batum), imported. Gen. Distr.: Medit. Described from Italy.

Genus 181. *NARDURUS** RCHB.**

Rchb. in Godr. Fl. Lorr. III (1844) 187.

Small plants, mostly with a 1-sided spike. Spikelets short-pedicel, solitary, ranked, inserted in concavities of the flexuous rachis, loosely 3-6-flowered. Lemmas narrowly lanceolate, keelless, convex, lanceolate, short-awned, obscurely 5-nerved; paleas lanceolate, bidentate, hispid on the keels. Stamens 3; anthers oblong-elliptical, to 1 mm long. Annuals.

* From *nardus* - mat-grass, and *ura* - tall.

** Compiled by V. I. Krechetovich and E. G. Schrov.

- 540 1. Green plants; spikelets remote, 3-4-flowered, loose, borne on pedicels 1.5-2.2 mm long; rachis finely winged, scabrous 2. *N. Krausei* (Rgl.) V. Krecz. et Bobr.
+ Grayish-green plants; spikelets crowded, 4-5-flowered, dense, borne on pedicels 0.5-1 mm long; rachilla obtusely angular, smooth 1. *N. tenuiflorus* (Schr.) Boiss.

1. *N. tenuiflorus* (Schr.) Boiss. Fl. Or. V (1884) 632, non Boiss. Voy. Esp. II (1839-45) 667. - *Festuca tenuiflora* Schr. Fl. germ. I (1806) 345. - *Festuca maritima* B. Fedtsch. et auct. exp., non L. - *Catapodium unilaterale* Griseb. in Ldb. Fl. Ross. IV (1853) 347. - *Triticum hispanicum* Georgi, Besch. Russ. III 4 (1800) 721, non Willd. - Ic.: Rchb. Ic. Fl. Germ. I, tab. 15, fig. 1371.

Annual. Culms numerous, slender, to 20 cm tall, smooth; leaves and their sheaths smooth, grayish-green like the other parts of the plant, to 2 mm broad. Spike erect, rather dense, irregularly 2-ranked or 1-sided; rachis obtusely angled and smooth; spikelets appressed, borne on pedicels 0.5-1 mm long, 4-5-flowered, rather dense, with a scabrous rachilla; glumes linear, acuminate, keeled, the lower 1-nerved, 2 mm long, the upper 3-nerved, twice as long; lemmas narrowly lanceolate, subacute, with a short, scabrous awn, smooth toward the summit, scabrous only below the tip and at the base of the awn, obscurely 5-nerved; paleas narrowly lanceolate, bidentate, hispid on the keels. Anthers to 1.5 mm long. April-May. (Plate XLI, Figure 2 a-e).

A weed. - European part: Crimea (south); Caucasus: West. Transcauc. (Batum). Gen. Distr.: Western Europe. Described from Germany.

2. *N. Krausei* (Rgl.) V. Krecz. et Bobr. comb. n. - *Festuca Krausei* Rgl. in A. H. P. VII, 2 (1881) 594. - *Festuca maritima* Roshev. ex Fedtsch. in A. H. P. XXXVIII, 1 (1924) 127, non L. - *Nardurus Woronowii* Schischk. in Bull. Mus. Georg. I (1920-22) 3. - *N. maritimus* Grossh. Fl. Kavk. (Fl. Cauc.) I (1928) 120, non Hack. - Exs.: HFR No 599; Sintenis, It. transc. 1900-01, 319 (sub nom. *Fest. tenuiflora*).

Annual. Culms suberect or weakly geniculate, slender, to 20 cm tall, glabrous, green like the rest of the plant; leaves subinvolute, to 2 mm broad, rather soft, blades and sheaths glabrous. Inflorescence simple, spike-like, 1-sided, rachis on pedicels 1.5-2 mm long, containing 3-4 remote florets borne on a scabrous rachilla; glumes acute, the upper 4-5 mm long, narrowly linear-lanceolate, 3-nerved, the lower 1/2 as long, 1-nerved, scaberulous at the summit; lemmas linear-lanceolate, to 4-5 mm long, subacute, with a scabrous awn nearly as long, scaberulous toward the summit on the margin and on the back (occasionally the florets hirsute); anthers oblong-elliptical, to 1 mm long. March-April.

- 541 Gritty mountain slopes and submontane deserts. - Caucasus: South. and East. Transcauc.; Centr. Asia: Tyan'-Shan (west), Upp. Turkest. Gen. Distr.: Persia. Described from Chotkal, in Centr. Asia. Type in Leningrad.

Genus 182. SCLEROPOA* GRISEB.

Griseb. Spicifl. Fl. Rum. II (1844) 431.

Inflorescence paniculate, with divaricate, thickened, short branches, bearing spikelets on short, 3-angled pedicels; spikelets linear-lanceolate, compressed, 5-8-flowered. Glumes subequal, keeled, the upper with 3 thickened nerves, the lower 1-nerved; lemmas keeled, oblong-lanceolate, obtuse or weakly awned, 5-nerved; palea subacute, with 2 keels. Stamens 3. Stigmas subsessile, plumose. Caryopsis oblong, obtuse, notched on the top, fused to the lemma. Annual plants.

1. Lemmas 4-4.5 mm long, subtriangular in section, keeled, with rather distinct nerves; spikelets narrow, contracted, 7-16 mm long, borne on pedicels 1-1.5 mm long 2.
- + Lemmas ca. 2 mm long, rounded in section (not keeled), with distinct nerves; spikelets oblong-ovoid, with divaricate florets, 5-6 mm long, borne on pedicels to 2-2.5 mm long. (Plate XLI, Figure 7) 2. *S. rigida* (L.) Griseb.
2. Spikelets dense, narrowly linear, 10-16 mm long; lemmas distinctly nerved; inflorescence axis and branches terete, scaberulous (Plate XLI, Figure 6) 1. *S. Woronowii* Hack.
- + Spikelets oblong, 7-10 mm long; lemmas subobtuse, obscurely nerved; inflorescence axis and branches angular, the angles hispid (Plate XLI, Figure 8) 3. *S. rigescens* (Trin.) Grossh.

1. *S. Woronowii* Hack. in Wor. et Schelk. Sched. Herb. Fl. Cauc. II - IV (1914) 27; Grossg. Fl. Kavk. (Grossh. Fl. Cauc.) I, 121.

Annual. Culms ascending, subterete-3-angled, smooth, leafy to a considerable height; sheaths enlarged at the top, smooth, investing the lower part of the inflorescence, terminating in a short subinvolute blade to 2 mm broad. Inflorescence an oblong panicle, 3-8 cm long, more or less 1-sided, somewhat nodding at the top, main axis and branches subterete, the latter scabrous on the obscure angles; branches appressed at first, later divergent, each bearing 1-5 spikelets; spikelets narrowly linear, dense, contracted, 10-16 mm long, 5-flowered, borne on pedicels to 1 mm long; glumes unequal, lanceolate, subobtuse, the pronounced keel scabrous toward the summit, the upper glume 3-nerved, to 3-4 mm long, the lower 542 1-nerved, to 2.5-3 mm long; lemmas oblong, subcarinate with very pronounced nerves, to 4-4.5 mm long, obtuse, often apiculate, scaberulous on the keel toward the summit. May. (Plate XLI, Figure 6 a-c).

Solonchaks. -Caucasus: East. Transcauc. Endemic. Described from Shogrel' Lake in Mil'skaya Steppe. Type in Leningrad.

2. *S. rigescens* (Trin.) Grossh. in Fl. Kavk. (Fl. Cauc.) I (1928) 121. -*S. procumbens* Drob. in Oprel. r. okr. Tashkenta (Key to Plants of the Surroundings of Tashkent) I (1923) 35, non Curt. -*Festuca rigescens* Trin. in Sched. Herb. Hohenack. (1838). -*S. rigida* β Trinii Boiss. Fl. Or. V (1884) 638. -*S. rigida* Griseb. in Ldb. Fl. Ross. IV, 347 et auct., ex p.

* From Greek scleros - hard, and pos - bluegrass.

** Compiled by V. I. Krachetovich and E. G. Bobrov.

Annual. Culms numerous, ascending, 15-40 cm tall, leafy to a considerable height; leaves flat, to 2 mm broad, scabrous on the margin; ligule long. Inflorescence 5-10 cm long, oblong, more or less 2-ranked, later subdivaricate, angles of inflorescence axis and branches prickly or setose-prickly, branches bearing 1-8 spikelets each, not subdivided; spikelets oblong-linear, always contracted, 7-10 mm long, 5-7-flowered, borne on pedicels 1-1.5 mm long; glumes unequal, strongly triangularly keeled, acute, scabrous toward the summit, the upper to 3 mm long, with 3 thickened nerves, the lower 1-nerved, 2.5 mm long; lemmas strongly keeled, triangular, with pronounced lateral nerves, to 5 mm long, subobtusate, scaberulous toward the summit; palea prickly on the keels toward the summit. April-May. (Plate XLI, Figure 8 a-e).

Sands and stony slopes. -Caucasus: East, Transcauc. (eastern part), Tal.; Centr. Asia: Syr-Dar., Amu-Dar., Upp. Turkm. (Kushka), Endemic. Described from Lenkoran'. Type in Leningrad.

3. *S. rigida* (L.) Griseb. Spicil. fl. Rum. II (1844) 431 et in Ldb. Fl. Ross. IV, 347, exp. -*Poa rigida* L. Amoen. Acad. IV (1759) 265. -*P. pulchella* M. B. Fl. taur. cauc. I (1808) 417. -Ic.; Rchb. Ic. Fl. Germ. I, tab. 58, fig. 1518. -Exs.: Fl. Aust.-Hung. exs. No 1083; Kneucker Gram. exs. No 51.

Annual. Culms numerous, geniculate-ascending, 5-30 cm tall, stiff, leafy; leaves linear, acuminate, scabrous on the margin. Panicle 5-10 cm long, stiff, 1-sided, oblong-lanceolate, contracted, scaberulous on the angles of axis and branches; the finally spreading branches short, scabrous, subdivided, spikelet-bearing from the base; spikelets ovate or oblong-ovate, later subdivaricate, 5-6 mm long, 6-7-flowered, on pedicels 2-2.5 mm long; glumes subequal, linear-lanceolate, convex-keeled, to 2 mm long, subacute, scabrous on the keel toward the summit; lemmas keelless, with a distinct mid-nerve and obscure lateral nerves, 2 mm long, subacute or obtuse, smooth; palea scaberulous on the keels. May. (Plate XLI, Figure 7 a-e).

343 Rocks and stony slopes. -European part: Crimea; Caucasus: West. and East, Transcauc., Dag., Tal. Gen. Distr.: Mediterranean. Described from the Balkan Peninsula (Romania). Type in London.

Genus 183. SCHIZACHNE* HACK.

Hack. in Fedde, Repert. Sp. nov. VII (1909) 322.

Inflorescence a subracemiform panicle, bearing few spikelets. Spikelets many-flowered, articulate below each floret; rachilla glabrous. Glumes unequal, 3-5-nerved. Lemmas 7-nerved, with tufts of hairs at the base, glabrous elsewhere, awned from below the bifid apex. Caryopsis oblong, dark brown.

1. Leaves flat or partly involute, glabrous on the underside, sparsely covered with fine hairs on the upper surface
1. *S. callosa* (Turcz.) Roshev.

* From Greek schizmos [sic] - to split, and achne - tip [sic], alluding to bidentate tip of lemma.

+ Leaves flat, smooth on the underside, scabrous on the upper surface, hairless. Only in Kamchatka 2. *S. Komarovii* Roshev.

1. *S. callosa* (Turcz.) Roshev. comb. nova. - *Avena callosa* Turcz. Cat. Baikal. (1838) No 1295; Griseb. in Ldb. Fl. Ross. IV 416; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 246. - *S. Fauriei* Hack. in Fedde Repert. Sp. nov. II (1909) 322. - *S. purpurascens* Roshev. in Fl. Zabaik. (Flora of the Transbaikalian Region). I (1929) 91 (non Swall).

Perennial. Loosely tufted; rhizome short-creeping; culms 40-60 cm tall, glabrous, smooth, scabrous below the inflorescence; leaves flat or partly involute, 1-4 mm broad, glabrous underneath, sparsely covered on the upper surface with fine, soft hairs; ligule short, 1-1.5 mm long on the upper leaves. Inflorescence a few-flowered, narrow, 1-sided, racemiform panicle, to 10 cm long, with scabrous branches; spikelets linear-lanceolate, 3-5-flowered, 10-12 mm long, with glabrous rachilla; glumes membranaceous, broadly lanceolate, the lower glume 1-3-nerved, shorter than the 5-nerved upper glume; lemmas longer than the glumes, with hairs ca. 1.5 mm long at the base, awned from just below the divisions of the bifid apex, the awn 1 1/2 times as long as its lemma; palea much shorter than the lemma; stamens with anthers 1-1.5 mm long. June-August.

Forests and coppices. - European part: Volg. - Kam. (western Priural'e (Cisuralian region); West. Siberia: Ob' region; East. Siberia: Len. - Kol. (Sayany), Daur.; Far East: Ze. - Bur., Ussur., Sakh. Endemic. Described from Zabaikal'e [Trans-Baikal region]. Type in Leningrad.

544 NOTE. Differs from the American species *S. purpurascens* (Torr.) Swall. in more restricted growth, leaves pilose on the upper surface, and smaller anthers, the latter attaining a length of 2-2.5 mm in the American plant.

2. *S. Komarovii* Roshev. com. nov. - *A. striata capillipes* Kom. Fl. Kamch. I (1927) 158. - *A. striata* Hult. Fl. of Kamtch. I (1927) 118 (non Michx.).

Perennial. Loosely tufted; rhizome short-creeping; culms 50-100 cm tall, glabrous, smooth; leaves rather flat, 2-3 mm broad, smooth underneath, scabrous on the upper surface, glabrous; ligule very short. Panicle 5-13 cm long, loose, diffuse, nodding, with scabrous branches to 7 cm long; spikelets narrowly lanceolate, 3-6-flowered, 10-17 mm long, variegated; the lower glume 1-nerved, shorter than the upper, 3-nerved glume; lemmas more than twice as long as the glumes, with a ring of hairs 1-1.5 mm long at the base, bifid at the apex, the awn attached just below the summit and attaining 1 cm in length; palea much shorter than the lemma; stamens with anthers 1-1.5 mm long. July-August.

Birch woods and dry river terraces. - Far East: Kamchatka. Endemic. Described from the surroundings of the village Ganal. Type in Leningrad.

NOTE. Differs from the American species *S. purpurascens* (Torr.) Swall. in border inflorescence and smaller anthers, the latter attaining a length of 2-2.5 mm in the American plant.

Spikelets arranged in a dense, 1-sided spike, subsessile in concavity of the rachis, solitary, few-flowered, dense. Glumes longer than the spikelets, subulate, membranaceous-margined toward the base, with 1 thick nerve. Lemmas rather plump, convex, ovate, obtuse, with a short scabrous awn and 5 faint nerves. Palea bidentate, 2-nerved, setulose on the nerves nearly to the base. Stamens 3, anthers elliptical; ovary with 2 plumose stigmas. Caryopsis oblong, notched on the top. Annual plants.

1. *L. orientale* (Boiss.) V. Krecz. et Bobr. comb. nov. - *Nardurus orientalis* Boiss. Diagn. ser. 1, VII (1846) 127; Fl. Or. V (1884) 633. - *Festuca aleppica* Hochst. in Steud. Syn. Gram. (1855) 302. - *F. orientalis* B. Fedtsch. in A. H. P. XXXVIII (1924) 128, non Kerner. - Exs.: Sintenis - Iter Transcaspico-persic., 1900-1901, No 1886 (sub *Narduro orientali*).

- 545 Annual. Culms solitary or in bunches of several, to 15 cm long, erect; leaves setaceous-involute, as long as the inflorescence, the upper leaf sheaths enlarged and investing the lower part of the inflorescence. Inflorescence an erect or recurved, 2-ranked, 1-sided spike, 3-6 cm long; spikelets sessile, dense, 3-5-flowered; glumes stiff, linear-lanceolate, subequal, the upper ca. 4 mm long, the lower ca. 3-3.5 mm long, with 1 thick nerve, scabrous on the margin; lemmas ovate, subobtusely, terminating in an awn 1-1.5 mm long, ca. 3 mm long, obscurely nerved, short-pilose (occasionally only the 1 or 2 lowest lemmas pilose, the others glabrous); palea strongly ciliate on the keels; anthers broadly elliptical, to 0.5 mm long. April-May. (Plate XL, Figure 1 a-f).

Lower levels of mountains in the desert zone. - Caucasus: South. Transcauc.; Centr. Asia: Upp. Turkm., Pam. - Al. (west), Tyan'-Shan (west) Gen. Distr.: Asia Minor, Iran. Described from Syria. Type in Geneva.

Genus 185. *LOLIUM*† L.††

L. Sym. ed. 1 (1735); Gen. pl. ed. 5 (1754) 36.

Spikelets solitary, sessile, laterally compressed, appressed edgewise (with the backs of lemmas) to the rachis. Glumes in lateral spikelets solitary, present only on the outer side, stiff, with numerous nerves, awnless. Lemmas hyaline above, awnless or awned; palea bidentate, ciliate on the keels. Lodicules glabrous, entire or unevenly bilobed. Stigmas 2, plumose, sessile. Caryopsis fused to the palea, oblong, subconvex on the inner side, glabrous. Annuals or perennials, with glabrous, scaberulous leaves.

* Diminutive of the Latin *lolium* - rye grass.

** Compiled by V. I. Kreschetovich and E. G. Bobrov.

† Name of a weed mentioned by Virgil.

†† Compiled by S. A. Nevskii.

1. Lemmas awnless or with awn 0.1-0.4 (0.5) cm long 2.
 + Lemmas long-awned, the awn 0.6-1.5 cm long 7.
 2. Lemmas elliptical-ovate, somewhat cartilaginous in lower part... 3.
 + Lemmas lanceolate or oblong-lanceolate, herbaceous, thin 4.
 3. Glumes much exceeding the spikelet, 1.5-2.2 cm long. Lemmas with
 a short, slender awn (not exceeding 3 mm), or awnless
 2. *L. arvense* With.
 + Glumes shorter than the spikelet, to 1 cm long. Lemmas awnless ...
 4. *L. remotum* Schrank.
 4. Lemmas with a short awn (0.2-0.5 mm). Culms scabrous below the
 spikes 9. *L. multiflorum* Lam.
 + Lemmas awnless 5.
 546 5. Perennial 8. *L. perenne* L.
 + Annuals, more rarely biennials 6.
 6. Culm below the spike and rachis smooth; spikes greenish-purple, often
 falcate, with dilated rachis, subcylindrical
 7. *L. loliaceum* (Bory et Chaub.) Hand.-Mzt.
 + Culm below the spike and rachis scabrous; spikes usually green, erect
 or subfalcate, with a more slender rachis .. 8. *L. rigidum* Gaud.
 7. Lemma oblong-lanceolate, 0.8-1 cm long. Glumes shorter than the
 spikelet 5. *L. persicum* Boiss. et Hoh.
 + Lemma elliptical-ovate. 0.6-0.8 cm long. Glumes longer than the
 spikelet, more rarely same length 8.
 8. Spikelets oblong-linear, narrow, 0.3-0.35 cm broad; awns slender,
 0.6-0.9 cm long, scabrous owing to minute bristles
 3. *L. cuneatum* Nevski.
 + Spikelets oblong-elliptical or broadly linear, (0.3) 0.4-0.5 cm broad;
 awns stouter, 0.7-1.2 cm long, scabrous owing to minute bristles...
 1. *L. temulentum* L.

Section 1. *Craepalia* Asch. et Gr. Syn. II (1901) 750; Schrank.
 Baier. Fl. I (1789) 382 pro gen. - Lemmas subcartilaginous in lower part,
 elliptical-ovate, more rarely lanceolate.

Series 1. *Temulentae* Nevski. - Glumes longer than the spikelet or
 of same length, 1.2-3 cm long. Lemmas awned or awnless.

1. *L. temulentum* L. Sp. pl. (1753) 93; Griseb. in Ldb. Fl. Ross.
 IV, 345, p. parte; Shmal'g. Fl. (Schmalh. Fl.) II, 654, p. parte; Kryl.
 Fl. Zap. Sib. (Fl. of West. Sib.) II (1928) 344. - Ic.: Rchb. Ic. Fl. Germ.
 I, tab. 5, fig. 1342-44.

Annual. Culms solitary or few, 40-80 cm tall, very scabrous below the
 spikes, with blackish-brown or brown nodes; sheaths scaberulous; leaves
 flat, green, glabrous, scabrous on the upper surface, smooth underneath.
 Spikes 10-20 (25) cm long, with a scabrous rachis; the lower joints of the
 rachis 1.3-3 cm long; spikelets oblong-elliptical, cuneate-attenuate toward
 the base, 1-1.8 (2) cm long (awn excluded), (0.3) 0.4-0.5 cm broad (without
 glumes), (3) 5-9-flowered; glume oblong-linear, longer than the spikelet
 or of same length, 1.2-2 cm long, subobtus, 7-9-nerved; lemmas ellipti-
 cal-ovate, 0.6-0.8 cm long, obtuse, occasionally bidentate below the awn,
 prolonged into awn 0.7-1.2 cm long. June-July. (Plate XLIV, Figure 1,
 a, b).

547 Among spring crops. - European part: Kar. - Lap., Lad. - Il'm., Dv. -
 Pech., Upp. Dnep., Upp. Volg., Volg. - Don; West. Siberia: Ob' region;

Caucasus: Transcauc. Gen. Distr.: Scand., Centr. and Atl. Eur., West. Medit., East. Scand.; Balk.-Asia Min., N. Am. Described from Europe. Type in London.

NOTE. A noxious weed of fields sown to field crops. The poisonous properties of *Lolium temulentum* seeds have been known since Pliny's time. Only those seeds are toxic which contain hyphae of a fungus between the seed coat and the aleurone layer. The fungus is apparently responsible for the formation of a toxic alkaloid, temulin - $C_7H_{12}N_2O$.

2. *L. arvense* With. Nat. arr. Brit. pl. ed. 3. II (1796) 168. - *L. speciosum* Stev. ex M. B. Fl. taur.-cauc. I (1809) 80. - *L. temulentum* β *speciosum* Griseb. in Ldb. Fl. Ross. IV (1953) 345.

Annual. Culms solitary or few, fairly stout, hollow, 40-75 cm long, scaberulous below the spike; leaf sheaths smooth; leaves flat, scabrous on the upper surface, smooth underneath. Spikes 14-30 cm long, rachis scabrous; the lower joints of the rachis (1) 1.5-3.2 cm long; spikelets oblong-elliptical, awnless or with very short and slender awns, 4-6-flowered, 1-1.6 cm long, 0.4-0.5 cm broad (without glumes); glume oblong-linear, obtusely pointed, much longer than the spikelet, 1.5-2.2 cm in length, with numerous nerves; lemmas elliptical-ovate, 0.6-0.8 cm long, scarious above, awnless, or with a very slender awn to 3 mm long, covered with rather long bristles. May-August. (Plate XLIV, Figure 2, a, b).

Pebbly and sandy river banks, also among crops. - European part: Priborn.; Caucasus: East. Transcauc., Dag. Gen. Distr.: Centr. and Atl. Eur., West. and East. Medit., Balk.-Asia Min. Described from England. Type in London.

3. *L. cuneatum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Annual. Culms 50-75 cm tall, geniculate below, very scabrous below the spike; leaves flat, scabrous on the upper surface, nearly smooth underneath, to 0.5-0.6 cm broad; spikes 15-30 cm long, rachis scabrous, the lower joints of rachis (1.8) 2-3.5 (3.6) cm long; spikelets oblong-linear, cuneate-attenuate toward the base, 1.3-2.5 cm long (excluding awn), 0.3-0.35 cm broad (excluding glume), 6-9-flowered; glumes oblong-linear, overtopping the spikelet, 1.3-2.9 cm long, subobtuse, 7-9-nerved; lemmas elliptical-ovate, 0.6-0.7 cm long, with awn 0.6-0.9 cm long. May-June. (Plate XLIV, Figure 3, a, b).

Wheat and barley fields. - Centr. Asia: Syr-Dar., Pam.-Al., Kara-Kum, Upp. Turkmen. Gen. Distr.: Iran, Ind. - Him. Described from Kugitang-Dar'ya Valley. Type in Leningrad.

Series 2. *Remotae* Nevski. - Glumes shorter than the spikelets, 0.6-1 cm long. Lemmas awnless.

4. *L. remotum* Schrank, Baier. Fl. I (1789) 382; Shmal'g. Fl. (Schmalh. Fl.) II 653. - *L. linicola* A. Br., Flora 1834, p. 258; Griseb. in Ldb. Fl. Ross. IV, 344. - Ic.: Fl. Dan., tab. 1864.

548 Annual. Culms few, erect or slightly bent at the base, smooth or scaberulous below the spike, slender, to 80 cm tall; sheaths smooth; leaves flat, light green, scabrous or nearly smooth on the upper surface. Spikes slender, 6-13 cm long, rachis smooth; spikelets small, oblong-elliptical, 0.8-1.4 cm long, (3) 5-7-flowered, awnless; glume linear, shorter than the spikelet, 0.6-1 cm long, subobtuse; lemma 0.4-0.5 cm long. July-August. (Plate XLIV, Figure 4, a, b).

Flax fields. European part: Dv. - Pech., Lad. - Il'm., Upp. Dnep., Upp. Volg., Volg. - Don; Far East: Ussur. Gen. Distr.: Scand., Centr. and Atl. Eur., West. Medit., Balk. - Asia Min. Described from central Europe.

NOTE. A weed of flax fields, hence also known as flax rye grass. It is difficult to distinguish its seeds from those of flax, as they resemble the latter in size and have almost identical winnowing properties (winnowing index of flax seeds - 15.3, of *L. remotum* - 15).

Series 3. *Persicae* Nevski. - Glumes shorter than the spikelets. Lemmas long-awned.

5. *L. persicum* Boiss. et Hoh. Diagn. ser. 1, XIII (1853) 66; Shmal'g. (Schmalh.) Fl. II, 654. - *L. temulentum* β *gracile* Regel in A. H. P. VII (1880) 593.

Annual. Culms 20-90 cm tall, bent at the base, scaberulous below the spikes; leaves flat, to 8 mm broad, scabrous on the upper surface and on the margin, smooth underneath. Spikes 7-30 cm long, rachis scabrous; spikelets 5-7-flowered, 1.5-2.2 cm long (excluding awn); glume shorter than the spikelet, (0.7) 1-1.6 (1.7) cm long, oblong-linear, obtuse; lemmas lanceolate or oblong-lanceolate, (0.8) 0.9-1 cm long, the slender awn, (0.8) 0.9-1.5 cm long; palea slightly longer than or as long as the lemma, ciliate on the keels above. June-July. (Plate XLIV, Figure 5, a, b).

Stony slopes, coppices, more rarely among crops. - Caucasus: Ciscauc., South. and East. Transcauc.; Centr. Asia: Upp. Turkm., Pam. - Al., Syr-Dar., Tyan'-Shan. Gen. Distr.: Arm. - Kurd., Iran. Described from the surroundings of Derbent (Persia). Type in Geneva, cotype in Lenin-grad.

Section 2. *Eulolium* Gren. et Godr. Fl. France III (1856) 612. - Lemma herbaceous, thin, lanceolate.

Series 1. *Rigidae* Nevski. - Annuals. Spikelets awnless. Spikes 551 more or less bent.

6. *L. rigidum* Gaud. Agrost. Helv. I (1811) 334; Shmal'g. (Schmalh.) Fl. II, 653. - *L. strictum* Griseb. in Ldb. Fl. Ross. IV (1853) 344, non Presl. - *L. durum* et *L. cylindricum* C. Koch in Linn. XXI (1838) 434.

Annual. Culms fairly numerous, (15) 30-60 cm tall, purple on the lower nodes, geniculate-ascending, scabrous (rarely smooth) below the spike; sheaths scaberulous; leaves narrow, scabrous on the upper surface. Spikes erect or slightly bent, slender, 8-25 cm long; rachis joints very scabrous; spikelets green, (0.9) 1-2 cm long, cuneate-attenuate toward the base, 4-10-flowered, narrow, awnless; glumes (0.7) 0.8-1.7 cm long, shorter than or as long as the spikelet, 5-7-nerved, acuminate; lemmas lanceolate, semi-transparent-scarious above, subobtuse, 5-nerved, 0.5-0.8 cm long. May-June. (Plate XLIV, Figure b, a-d).

Explanation to Plate XIII

1. *Boissiera pumilo* (Trin.) Hack., inflorescence, a) spikelet, b) lemma. - 2. *Bromus sterilis* L., ovary (after Kunth). - 3. *B. briziformis* F. et M., inflorescence, a) spikelet. - 4. *B. rigidus* L. inflorescence, a) spikelet. - 5. *B. Danthoniae* Trin., inflorescence, a) spikelet. - 6. *B. gracillimus* Bge., inflorescence, a) spikelet. - 7. *B. sericeus* Drob., spikelet. - 8. *B. secalinus* L., spikelet. - 9. *B. squarrosus* L., spikelet. - 10. *B. japonicus* Thunb., spikelet. - 11. *B. oxyodon* Schr., spikelet.



Weedy places. -Caucasus: Ciscauc., Dag., West., East., and South. Transcauc.: Centr. Asia: Upp. Turkm. Gen. Distr.: Centr. and Atl. Eur., Medit., Balk. -Asia Min., Arm. -Kurd., Iran. Described from Switzerland. Type in Lausanne.

7. *L. loliaceum* (Bory et Chaub.) Hand. -Mzt. in Ann. Naturhist. Hofmuseum XXVIII (1914) 32. -*Rottboellia loliacea* Bory et Chaub. Exp. sc. de Morée III, 2 (1832) 46, pl. III, fig. 2. -*Crypturus loliaceus* Link in Linnaea XVII (1843) 3, 87. -*Lolium subulatum* Vis., Fl. Dalm. I (1842) 90, tab. 3. -*L. lepturoides* Boiss., Diagn. ser. 1, XIII (1852) 67.

Annual. Culms ascending and geniculate at the base, 10-35 cm tall, purple at lower nodes, quite smooth below the spikes, rather stout; sheaths smooth, the lower ones purple-tinged; leaves narrow, involute or with inrolled margins, scabrous on the upper surface, smooth underneath. Spikes gladiate, more rarely erect, subcylindrical, with dilated rachis, greenish-purple, 6-15 cm long; rachis joints quite smooth, scaberulous only on the edges of concavities; spikelets somewhat laterally compressed, (0.7) 1-1.5 cm long; glume subobtus, (0.6) 0.8-1.3 cm long, shorter than the spikelet, more rarely as long, smooth, 7-9-nerved; lemmas lanceolate, hyaline at the summit, subobtus, 5-nerved. (Plate XLIV, Figure 7, a-e).

Maritime sands. -European part: Crimea; Caucasus: West. and East. Transcauc. (Apsheron. Penins.). Gen. Distr.: West. Medit., Balk. -Asia Min. Described from Greece.

Series 2. *Multiflorae* Nevski. Annuals or biennials. Spikelets awned. Spikes erect.

8. *L. multiflorum* Lam. Fl. Franc. III (1778) 621; Shmal'g. Fl. II, 653. -*lc.*: Rchb. *lc.* Fl. Germ. I, tab. 5, fig. 1345.

Biennial or annual. Culms 20-65 cm tall, scabrous below the spikes; sheaths scabrous; leaves flat, 1.5 mm broad, scabrous on the upper surface and margins. Spikes erect (more rarely slightly nodding), 8-15 cm long, rachis scabrous on main angles; spikelets green, (7) 10-12 (20)-flowered, 1.2-1.8 (2.5) cm long; glume narrowly lanceolate, shorter than the spikelet (usually 1/2 the length), 0.7-0.9 (1.2) cm long; lemmas lanceolate, 5-nerved, awned in upper florets, the awn 0.2-0.5 cm long, in lower florets usually awnless. July-August. (Plate XLIV, Figure 8, a, b).

552 Weedy places. -European part: Upp. Dnep., Volg. -Don.; Caucasus: West. Transcauc. Gen. Distr.: Scand., Centr. and Atl. Eur., West. Medit., N. Am. Described from France. Type in Rostock.

ECONOMIC IMPORTANCE. A most valuable grass, known as Italian rye grass. Unfortunately, Italian rye grass is subject to freezing in the U.S.S.R., and can be grown successfully only along the Black Sea coast and in the southwest of the Ukrainian S.S.R.

Series 3. *Perennes* Nevski. Perennials. Spikelets awnless.

9. *L. perenne* L. Sp. pl. (1753) 83; Griseb. in Ldb. Fl. Ross. IV (1853) 343; Shmal'g. Fl. II, 653. -*L. Marschallii* Stev. in Bull. Soc. Nat. Mosc. XXX (1857) 103. -*lc.*: Fl. Dan. tab. 747.

Perennial. Densely tufted; culms ascending or erect, perfectly glabrous and smooth, 15-65 cm tall; sheaths smooth, leaves narrowly linear, 1-4 mm broad, glabrous and smooth. Spikes erect or slightly nodding, regular, (5) 8-15 (25) cm long; rachis joints quite smooth; spikelets 5-10 (14)-flowered (more rarely 3-5-flowered), narrow, 0.8-1.6 (2.2) cm

long; glume linear-lanceolate, subobtusely acuminate, shorter than the spikelet, 0.6-0.9 (1.1) cm long, 7-9-nerved; lemmas awnless, 0.5-0.7 cm long. June-September. (Plate XLIV, Figure 9, a-c).

Meadows, weedy places. -European part: Kar. -Lap., Lad. -Il'm., Upp. Dnep., Upp. Volg., Volg. -Kam., Volg. -Don, Mid. Dnep., Black Sea Region, Crimea; Caucasus: Ciscauc., Dag., West. and East. Transcauc.; West. Siberia: Irt., Ob' region.; Centr. Asia: Upp. Turkm., Pam. -Al., Syr-Dar. Gen. Distr.: Scand., Centr. and Atl. Eur., Medit., Balk. -Asia Min., Iran, Ind. -Him., N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. A good forage grass. Known in cultivation as English rye grass. Much more suitable for grazing than for cutting. Its frost-resistant forms deserve to be recommended for wide use as pasture plants. Also suitable as a lawn grass.

Genus 186. PSILURUS TRIN*.

Trin. Fund. (1820) 93

Spikes very slender, filiform, flexuous or bent, with solitary spikelets. Spikelets sessile, 2-flowered (the lower floret fertile, the upper rudimentary, borne on an extension of the rachilla), in concavities of the slender, scabrous rachis. Glume triangular, very small, exceeded many times by the floret. Lemmas narrow, short-awned. Lodicules 2, irregularly bifid. Stamen solitary. Caryopsis linear, glabrous, fused to lemma and palea. Annual plants.

- 553 1. *P. aristatus* (L.) Duv. -Jouve. in Bull. Soc. Bot. Fr. XIII (1866) 132. -*Nardus aristata* L. Sp. pl. ed. II (1762), 78. -*Psilurus nardoides* Trin. Fund. (1820) 73; Griseb. in Ldb. Fl. Ross. IV, 325; Shmal'g. Fl. II, 655. -Ic.: Rchb. Ic. Fl. Germ. I, tab. 1.

Annual. Culms slender, 7-30 cm tall; culm-leaves filiform, very short (0.8-2.5 cm long), involute; sheaths long in relation to blades, smooth; ligule very short. Spikes 4-15 (20) cm long; spikelets greenish-purple or purple, shorter than the joints of the rachis, 0.5-1.6 (0.7) cm long (excluding awn); glume 0.5-0.75 (1) mm long; lemmas with a slender awn, 0.5-0.8 cm long. April-May. (Plate XLIV, Figure 11, a, b).

Wormwood steppes, dry argillaceous and stony slopes. -European part: Crimea; Caucasus: East. Transcauc.; Centr. Asia: Pam. -Al.; Upp. West. Turkm. Gen. Distr.: West., Medit., Balk. -Asia Min., East. Medit. Described from the surroundings of Rome. Type in London.

Genus 187. LITTLEDALEA HEMS. **

Hemsl. in Hook. Ic. Pl. V (XXV) (1896) t. 2472.

Inflorescence an open or contracted panicle. Spikelets many-flowered, large, awnless, flat, with a glabrous or scaberulous rachilla. Glumes

* Compiled by S. A. Nevskii.

** Compiled by S. A. Nevskii.

unequal, acuminate, the lower 1- or 3-nerved, the upper 3- or 5 (7)-nerved, shorter than, more rarely as long as the lowest florets. Lemmas elliptical-lanceolate, obtusely or erose at the apex, glabrous or minutely pubescent, with numerous nerves. Palea lanceolate, 2-keeled, ciliate on the keels, emarginate, $1/3-2/3$ as long as the lemmas and much narrower. Lodicules asymmetrical, oval-lanceolate or oval, strongly pointed, hairy or ciliate at the tip. Anthers nearly as long as the palea; ovary hairy in upper part; stigmas subsessile, inserted just below the summit of the ovary on its proximal side, long-plumose. Perennial plants with creeping, branching rhizomes.

1. *L. alaica* (Korsh.) V. Petr. in colloquio. - *Bromus alaicus* Korsh. in Mém. Acad. Pétersb. sér. 8, IV (1896) 101.

554 Perennial. Culms 15-25 cm tall; leaves glaucous-green, smooth on the lower side, scabrous on the upper side, to 3 mm broad, subinvolute; leaf blade with linear, reflexed auricles at the base; ligule densely short-pilose; sheaths puberulent. Panicle contracted, with erect, sometimes scabrous, branches, to 1-1.5 cm long; spikelets 4-10, 5-11-flowered, 2.5-3.5 cm long, 1-1.5 cm broad, variegated; glumes unequal, the lower 0.8-1 cm long, 1-3-nerved, the upper 1-1.3 cm long, 3-5-nerved; lemmas elliptical-lanceolate, glabrous, obtuse, sometimes emarginate, minutely ciliate on the margin toward the summit, 1.2-1.7 cm long, 0.4-0.6 cm broad, purple at the middle, brownish-white-hyaline in upper part, faintly 7-13-nerved. Palea $2/3$ the length of the lemma, 0.8-1.1 cm long and only 1-2 mm broad. June-July. (Plate XLIII, Figure 8, a-e).

Stony slopes and stone drifts in mountain-stream valleys. - Centr. Asia: Pam. - Al. Endemic. Described from Alaïskaya Valley (Myn-Yar River). Type in Leningrad.

NOTE. An allied species, *L. tibetica* Hemsl. from Tibet, differs in the open panicle, slender branches, and lemmas strongly erose at the apex, more hyaline, and distinctly nerved.

Genus 188. BROMUS L.

L. Gen. pl. ed. 5 (1754) 33.

Inflorescence fairly large, paniculate. Spikelets many-flowered, large, laterally compressed. Glumes unequal, shorter than the lemmas and paleas. Lemmas 5-9-nerved, faintly keeled, membranaceous at the summit, mostly bidentate, short-awned from between the teeth or just below, more rarely awnless. Palea membranaceous, with 2 ciliate keels, subemarginate. Lodicules membranaceous, oblong, glabrous. Pistil with sessile, plumose stigmas. Stigmas attached below the summit of the ovary. Caryopsis oblong, furrowed on the inside, somewhat adnate to the palea. Annual or biennial plants, with sheaths closed over most of their length, and leaves convolute in the bud (conduplicate in *B. erectus*).

Key to Subgenera

1. Perennials Subgenus I. *Zerna* (Panzer) Asch., p. 555
- + Annuals 2.
2. Spikelets dilated toward the apex Subgenus II. *Stenobromus* Griseb., p. 568
- + Spikelets attenuate toward the apex 3.
3. Lower glume 1-nerved, upper 3-nerved. Awn 4-5 times as long as its lemma. Subgenus III. *Nevskiella* V. Krecz. et Vved., p. 573
- + Lower glume 3-5-nerved, upper 5-7-nerved. Awn only slightly longer than its lemma. Subgenus IV. *Zeobromus* Griseb., p. 574

555 Subgenus I. *ZERNA** (Panzer) Aschers. Fl. Brandenb. I (1864) 859, emend.; Panzer in Denkschr. Ak. München 1813 (1814), 296, pro gen. - Sect. *Festucaria* Gr. et Godr. Fl. France III (1856) 586.

The lower glume 1-nerved, the upper 3-nerved. Awn straight or subdivaricate, not longer than the lemma, more rarely wanting. Spikelets attenuate or very slightly enlarged toward the apex. Perennial plants.

ECONOMIC IMPORTANCE. The perennial species of the genus *Bromus* are mostly of considerable value as forage grasses. Of particular importance in the U.S.S.R. is *Bromus inermis* Leyss. which is very satisfactory as regards feed value, and produces high yields of hay. It is, moreover, drought-resistant, and thus suitable for cultivation in the arid steppe zone. It is also necessary to try out under cultivation some other species, especially *B. Richardsonii* Link. and *B. variegatus* M. B. On dry slopes it is possible to grow *Bromus riparius* Rehm., although the forage value of this species is rather lower.

1. Culms enveloped at the base by reticulate-fibrillose dead sheaths of old leaves 2.
- + The dead sheaths of old leaves enveloping the base of culms entire or somewhat disintegration into fibers, but not reticulate-fibrillose ... 5.
2. Awn as long as the lemma or nearly so, 1-1.4 cm long, divaricate ... 19. *B. tomentellus* Boiss.
- + Awn shorter than the lemma, 0.3-0.6 cm long, straight or subdivaricate 3.
3. Low plants, 25-45 cm in height. Panicle ovaloid, with very slender branches, bearing small spikelets 1.7-2 (2.5) cm long. Lemmas 0.8-1 cm long 20. *B. cappadocicus* Boiss. et Bal.
- + Larger plants, 75-90 cm tall. Panicle with larger spikelets, 2.5-3.5 (4) cm long. Lemmas 1.1-1.6 cm long 4.
4. Panicle contracted, narrow, 9-15 cm long, with few spikelets. Awn 3-5 mm long, much shorter than the 1.3-1.6 cm long lemma. Sheaths glabrous, rarely puberulent. 20. *B. kopetdagensis* Drob.
- 556 + Panicle fairly loose, 20-25 cm long. Awn 5-8 mm long, slightly longer than the 1.1-1.2 (1.3) cm long lemma. Sheaths more or less covered with spreading, long hairs 18. *B. riparius* Rehm.
5. Rhizomes long-creeping. Plants with few or solitary culms 6.

* Compiled by S. A. Nevskii and V. R. Sochava.

- + Rhizomes short. Densely tufted plants with crowded culms 14.
- 6. Lemmas densely covered with long hairs all over the surface or only on the marginal nerves 7.
- + Lemmas glabrous or scabrous with minute appressed bristles (visible only with the aid of a strong magnifier), rarely somewhat appressed-hairy on the lower part 12.
- 7. Lemmas densely covered with long hairs all over the surface (on the sides and back) 8.
- + Lemmas covered with long hairs only on the marginal nerves, glabrous on the back, with few appressed bristles on the midnerve. . . . 9.
- 8. Glumes pilose on the back; lemmas 1-1.2 cm long 4. *B. ornans* Kom.
- + Glumes glabrous; lemmas 1.2-1.5 cm long 4. *B. Korotkyi* Drob.
- 9. Lemma awnless or terminating in an awn-point to 1 mm long. Densely pubescent plants 10.
- + Lemmas with awn 1.5-6 mm long. Plants mostly glabrescent, more rarely somewhat hairy 11.
- 10. Panicle 12-20 cm long, narrow, spikelets 2-3.5 cm long. Culms 70-100 cm tall 3. *B. irkutensis* Kom.
- + Panicle 3-6 cm long. Spikelets smaller, 0.8-1.5 (2) cm long. Culms 20-30 cm tall 6. *B. vogulicus* Soczava
- 11. Panicle loose, the strongly flexuous branches 2-3 times as long as the spikelets. Lemmas with awn (2.5) 3-6 mm long 8. *B. Richardsonii* Link.
- + Panicle narrow and rather contracted, the straight branches not longer than the spikelets or 1 1/2-1 1/4 times as long. Lemmas with awn 1.5-3 mm long 7. *B. sibiricus* Drob.
- 12. Spikelets awnless or with awn-points to 1.5 mm long. Lemmas glabrous, rarely somewhat hairy at the base 2. *B. inermis* Leyss.
- + Spikelets with awns 2-3 mm long. Lemmas very slightly roughened with minute appressed bristles 13.
- 557 13. Completely glabrous, glaucous plants. Lemmas 1.2-1.3 cm long, with awn 3-5 mm long 9. *B. Biebersteinii* Roem. et Schult.
- + Velutinous, grayish-green plants. Lemmas 0.9-1.2 cm long, with awn 2-3 mm long 10. *B. tomentosus* Trin.
- 14. Panicle 16-25 cm long, with very long, drooping branches. Spikelets usually green. Leaves flat, 5-10 (12) mm broad, scabrous, glabrous or sparsely hairy on the margin 1. *B. Benekeni* (Lge) Trimen.
- + Panicle to 15 cm long, or much shorter, short-branched, sometimes strongly contracted. Spikelets more or less purple-tinged. Leaves narrowly linear, 2-5 mm broad, glabrous or densely pubescent. . . . 15.
- 15. Spikelets narrow, linear-lanceolate, pale green or very slightly tinged with purple. Lemmas 0.8-0.9 cm long, with awn 2-3 mm long 11. *B. tyttholepis* Nevski.
- + Spikelets lanceolate, broader, purple or greenish-purple. Lemmas 0.9-1.3 cm long, with awn 3-10 mm long 16.
- 16. Panicle strongly contracted, but usually broad and ovoid in outline. The entire plant densely pubescent. Glumes, lemmas and paleas pilose 12. *B. adjaricus* Somm. et Lev.

- + Panicle loose, and if contracted, narrow and spikelike. Plants glabrous or velutinous. Glumes, lemmas and paleas glabrous or very slightly scabrous 17.
- 17. Leaves quite glabrous, scabrous (very sparsely covered with scattered hairs only on the upper surface) 18.
- + Leaves rather densely pubescent 19.
- 18. Spikelets dark-purple-striped. Lemmas with awn (5) 6-10 mm long. Caucasian plants 13. *B. variegatus* M. B.
- + Spikelets greenish-purple. Lemmas with awn 3-5 mm long. Central Asiatic plants 16. *B. angrenicus* Drob.
- 19. Spikelets linear-lanceolate, 2-3.5 cm long and 0.4-0.7 cm broad, (5) 6-10-flowered. Panicle containing (2-3) 5-6 (8) spikelets, narrow. Usually tall plants, attaining up to 85 cm in height; leaf sheaths and blades densely pilose or covered with long scattered hairs 14. *B. turkestanicus* Drob.
- + Spikelets lanceolate, 2-2.5 cm long and 0.5-0.8 (1.9) cm broad, usually 5-7-flowered. Panicle broadly ovaliform or slightly contracted, containing 5-11 spikelets. Small plants, to 35-40 cm tall 20.
- 20. Leaf sheaths glabrous, scaberulous ... 17. *B. pamiricus* Drob.
- + Leaf sheaths velutinous-tomentose or copiously covered with long, retrorse hairs 15. *B. Paulsenii* Hack.

558 1. *B. Benekeni* (Lge) Trimen in Journ. of Bot. (1872) 333. - *Schedonorus Benekeni* Lge. Fl. Dan. fasc. 48 (1871) 5. - *Zerna Benekeni* Lindm. Sw. Fan. fl. (1918) 101. - *Bromus ramosus* var. *Benekeni* Asch. et Graebn. Syn., II (1900) 576. - *B. ramosus* auct. Fl. Ross., non Huds. Fl. angl. ed. 1 (1762) 40. - *B. asper* Griseb. in Ldb. Fl. Ross. IV (1853) 356; Shmal'g. Fl. II 647, non Murr. - Ic.: Fl. Dan. tab. 2826. - Exs.: HFR No 1647 a et 1647 b.

Perennial. Rhizome short. Culms erect, 60-120 cm tall. Leaves green, flat, 5-10 (12) mm broad, thin, scabrous, usually sparsely pilose on the margin; sheaths of lower leaves densely pilose, upper sheaths glabrous or short-pubescent; ligule short, straight-truncate, fimbriate at the summit. Panicle 16-25 cm long, nodding at the top, the branches long, slender, scabrous, usually drooping, bearing 1-5 spikelets at the end; lower panicle branches 2-5 in number; spikelets lanceolate, 7-9-flowered, 2.5-3.5 cm long; glumes lanceolate, long-acuminate, the lower 0.75-0.8 cm long, the upper 1-1.1 cm long, scabrous. Lemmas 1.2-1.4 cm long, 5-nerved (rarely only 3 nerves evident), lanceolate, gradually acuminate, rough with sparse, appressed hairs, the hairs longer at the sides. Awn straight, 5-8 mm long; lemmas with 2 small teeth at the base of the awn. June-July.

Deciduous and mixed forests. - European part: Lad. - Il'm., Upp. Dnep. Upp. Volg., Volg. - Kam., Volg. - Don, Mid. Dnep., Crimea; Caucasus: Ciscauc., Dag., West. and East. Transcauc., Tal.; West. Siberia: Alt.; Centr. Asia: Upp. Turkm., Pam. - Al., Tyan'-Shan Dzung. - Tarb. Gen. Distr.: Scand., Atl. Eur., West. Medit., Centr. Eur., Balk. - Asia Min. Described from Loland Island.

NOTE. This species resembles *B. ramosus* Huds. which occurs in western Europe, but differs from it in the smooth or puberulent upper sheaths, more numerous lower panicle branches, and smaller spikelets.

2. *B. inermis* Leyss. Fl. Hal., ed. I (1761) 16; Griseb. in Ldb. Fl. Ross. IV, 357; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.), II 335. - *Schenodorus inermis* P. B. Agrost. (1812) 177. - *Zerna inermis* Lindm. Sw. Fan. Fl. (1918) 101. - *Bromus latifolius* Kar. et Kir. in Bull. Soc. Nat. Mosc. (1841) 865. - Ic.: Syreishchikov, Ill. Fl. Moscov. (Ill. Fl. of Moscow Province) I (1906) 153. - Exs.: HFR No 395.

Perennial. Rhizome creeping, branching; culms few, 30-100 (120) cm tall, not crowded, glabrous, more rarely pubescent below the nodes; leaves flat, rarely somewhat involute, 0.4-0.9 cm broad, glabrous or pilose on the upper side, scabrous on the margins and nerves; sheaths glabrous, rarely the lowest ones pubescent; ligule 1-2 mm long, ciliate. Panicle 10-15 cm long, oblong, erect, its branches ascending, arranged in 3's-7's. Spikelets oblong-linear, 1.5-3 cm long, 3-5 mm broad, 5-12-flowered, with a scabrous or pubescent rachilla, pale green or light grayish-purple; glumes glabrous, scabrous on the nerves, the lower 1/4 or 1/3 shorter than the upper, the latter to 9 mm long; lemmas 5-7-nerved, elliptical-lanceolate, 0.8-1 cm long, awnless, subobtusate, sometimes slightly emarginate, more rarely terminating in an awn-point to 1.5 mm long (var. *aristatus* Schur), usually glabrous, more rarely somewhat appressed-hairy on lower half (in var. *hirtus* Drob.); palea slightly shorter than the lemma, ciliate on the margin. June-July.

559 Meadows, meadow-covered slopes, fallows, bushy thickets. - European part: all regions; Caucasus: Ciscauc., Dag., East, and South. Transcauc.; West. Siberia: all regions; East. Siberia: Ang. - Sayan.; Daur., Len. - Kol.; Far East: Ussur. (introd.); Centr. Asia: all regions. Gen. Distr.: Europe, Dzung. - Kashg., Mong., N. Am. (introduced). Described from Halle (Saxony).

ECONOMIC IMPORTANCE. Owing to its high yields, resistance to shortage of moisture and low temperatures, modest requirements as regards soil conditions, and immunity to fungal diseases, smooth brome is one of the most valuable forage grasses. It is known as a field, meadow, and pasture grass. Stands of this plant can be used for hay cutting during 4 to 7 years. According to data obtained in various experiment stations, the highest yields of hay are provided by 2-year old stands *Bromus inermis*, ranging from 20 to 50 centners per hectare. The yields from older swards are lower, and vary according to geographical position. The development of *B. inermis* is enhanced in rain years. Smooth brome hay is somewhat coarse, but it is readily eaten by horses as well as large and small cattle. As regards nutritive value, it equals most of the well-known grasses cultivated in the U.S.S.R. Considering that the natural distribution area of *B. inermis* occupies a considerable part of the U.S.S.R., it may be assumed that the plant is suitable for cultivation in most regions of the country. Trials have confirmed that this plant may be cultivated even beyond the polar circle (Khibiny) and in eastern Siberia. However, owing to its drought-resistant strains, smooth brome should prove to be of greatest importance in the southeastern districts of the Russian S.F.S.R. which are characterized by a dry summer and cold, snow-deficient winters. According to the records of Z. N. Zhrebina (see her paper "Koster bezo-stnyi" ("Smooth brome"), *Rastenievodstvo* (Plant Production) I, 2 (1933), p. 507), the cultivation of *Bromus inermis* is particularly recommended for the southeastern part of TsChO*, central and lower Povolzh'e,

* [Tsentral'naya chernozemnaya oblast' (Central Chernozem Region).]

Tatar S.S.R., southern part of Bashkir A.S.S.R., eastern part of Ukrainian S.S.R., and southern part of western Siberia.

3. *B. irkutensis* Kom. in Not. Syst. Herb. Horti Bot. Petrop. II (1921) 130. -B. Pavlovii Roshev. in Severnaya Mongoliya. I. Predvarit. otch. o geolog., geokhim. i pochv. -geogr. issl. eksped. 1925 g. (Prelim. Rep. of the Geolog., Geochem. and Soil Geogr. Res. Exped., 1925) (1926) 162.

- 560 Perennial. Rhizome creeping. Culms stout, erect, 70-100 cm tall, hairy below the nodes; enveloped at the base by dead sheaths slightly separating into individual fibers. Leaves flat, 6-7 mm broad, densely covered with soft hairs; sheaths velutinous-tomentose. Panicle 12-20 cm long, contracted, its branches short, pilose, upright; spikelets 2-3.5 cm long, purple-tinged; glumes glabrous, the lower 0.75-1 cm long, the upper 0.9-1.2 cm long; lemmas lanceolate, 5-nerved, 1.2-1.2 cm long, terminating in an awn-point to 1 mm long, glabrous on the back and mid-nerve, densely-pilose on the margin; palea ciliate on the keels and covered with scattered hairs on the side facing the rachilla. July-August. (Plate XLIII, Figure 5, a-d).

Riverside sands. -East. Siberia: Ang. -Sayan. Gen. Distr.: Mong. Described from Irkut River valley. Type in Leningrad.

4. *B. Korotkyi* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XII (1914) 238. -Ic.: Drob., l. c., tab. XVIII.

Perennial. Rhizome long-creeping. Culms enveloped at the base by dead sheaths, copiously covered with white, spreading hairs; sheaths densely pilose or glabrescent. Panicle contracted, its branches 1-2, rarely to 5, cm long, arranged in 2's-5's; 2-3 upper spikelets sessile; spikelets 5-8-flowered, 1.5-3 cm long, with hairy rachilla; glumes lanceolate, 0.9-1.2 cm long, glabrous, unequal; lemmas oval-lanceolate, 5-7-nerved, 1.2-1.5 cm long, hairy on the dorsal nerves of the back all the way up (the hairs to 1.5-2 mm long), short-awned; palea lanceolate, long-ciliate on the keels in upper part.

Riverside sands. -East. Siberia: Daur. Endemic. Described from the sands along Ulan-Buri River. Type in Leningrad.

5. *B. ornans* Kom. in Fedde, Repert. sp. nov. XIII (1914) 87. -*B. arcticus* var. *ornans* E. Hulten Fl. of Kamtch. I (1927) 147. -Ic.: Hulten, l. c., tab. 6, fig. d.

Perennial. Rhizome creeping, slender; culms erect, ca. 50 cm tall, smooth, with scattered hairs; leaves densely covered with long hairs on both sides; sheaths densely covered with retrorse hairs; ligule to 1 mm long. Panicle 8-20 cm long, erect, contracted, its branches puberulent or scaberulous, sometimes slightly flexuous; spikelets 2-3 (3.5) cm long, 5-9-flowered, densely pubescent all over; glumes subequal, 0.7-1 cm long, mauve-purple, lanceolate, acuminate, pilose on the back; lemmas 5-7-nerved, oval-lanceolate, 1-1.2 cm long, purple in upper part, densely sericeous, awn straight, 2-4 mm long; palea lanceolate, 0.8-0.9 cm long, long-ciliate on the keels. Anthers orange, to 6 mm long. June-July. (Plate XLIII, Figure 4, a-d).

- 561 Sandy crests of river valleys, volcanic sands. -Far East: Kamch. Endemic. Described from Kamchatka. Type in Leningrad.

6. *B. vogulicus* Soczava in Compt. Rend. Ac. Sc. URSS (1929) 167.

Perennial. Rhizome creeping; culms 20-30 cm tall, enveloped at the base by light-brown dead sheaths, leaves to 5 mm broad, short, flat, sparsely covered with soft hairs; sheaths covered with soft hairs to 1 mm long, the sheath of the lowest leaf more strongly pubescent. Panicle 3-6 cm long, very contracted, its branches to 1 cm long, only the lower occasionally attaining 2-3 cm; spikelets dark-colored, (3) 4-6 (7)-flowered, 8-15 (20) mm long; glumes lanceolate, acuminate, with short bristles on the central nerve, the upper glume 3-nerved, 2 mm shorter than the 1-(3)-nerved lower glume; rachilla densely pilose; lemmas oval-lanceolate, subobtusely, awnless, sometimes terminating in a short awn-point, with 3 distinct nerves nearly reaching the apex and 2 faint nerves terminating at a considerable distance from the apex, densely covered on the margin with appressed or spreading, soft hairs, glabrous on the back, only the central nerve covered with appressed bristly hairs; palea lanceolate, ciliate on the keels. July.

Mountainous tundras. -Arctic: Arctic Sib. (Polar Ural). Endemic. Described from the sources of the river Kozhim. Type in Leningrad.

7. *B. sibiricus* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XII (1914) 229, pro parte. -*B. purpurescens* Turcz. ex Griseb. in Ldb. Fl. Ross. IV (1853) 357, nomen nudum, non *B. purpurascens* Delile. -*B. inermis* var. *sibiricus* Kryl., Fl. Zap. Sib. (Fl. of West. Sib.) II (1928) 335.

Perennial. Rhizome creeping culms pilose at the nodes, enveloped at the base by dead, tawny-colored, entire sheaths; leaves green, flat, scabrous, glabrous or sparsely pilose, their sheaths usually glabrous and smooth; ligule short, serrate. Panicle to 20 cm long, narrow and rather contracted, slightly nodding, its branches short, straight, scabrous, as long as the spikelets or $1\frac{1}{2}$ - $1\frac{3}{4}$ times longer, arranged in 1's-5's, each bearing 1-2 spikelets; spikelets purple, (1.6) 1.8-2.8 cm long, 5-7-flowered, with a hairy rachilla; glumes unequal, the lower 0.5-0.75 cm long, the upper 0.7-1 cm long; lemmas lanceolate, 1-1.2 cm long, 5-7-nerved, densely pilose on the marginal nerves, the midnerve and intermediate nerves short-pilose or scabrous, awn straight, 1.5-3 mm long. (June) July-August. (Plate XLIII, Figure 3).

Meadows. -Arctic: Arctic Sib. (N. Ural); European part: Volg. -Kam. (Centr. Ural); West. Siberia: Ob. region, Alt.; East. Siberia: Ang. -Sayan., Yenesei, Len. -Kol., Daur. Gen. Distr.; Mong. Described from western Siberia. Type in Leningrad.

565 **ECONOMIC IMPORTANCE.** According to data of the West Siberia Agricultural Experiment Station, this brome grass species is a valuable forage grass. In the conditions of western Siberia, Siberian brome grass yields normally two cuttings at an average rate of 63.75 centners per hectare (at the Experiments Station). Resistant to frost and drought and rather resistant to diseases. Its hay is less coarse than that of *B. inermis*. Cultivation of this brome grass is also recommended outside Siberia, in the European part of the U.S.S.R.

8. *B. Richardsonii* Link. Hort. Berol. II (1833) 281. -*B. sibiricus* var. *flexuosus* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XII (1914) 235. -*B. ciliatus* Griseb. in Ldb. Fl. Ross. IV (1853) 358, non L.

Perennial. Rhizome creeping; culms tall, hairy at the nodes, enveloped at the base by dead, entire, light-tawny-colored sheaths; leaves green, flat, glabrous or sparsely pilose, to 8 mm broad; sheaths of lower leaves

glabrous or covered with retrorse hairs; ligule short. Panicle to 25 cm long, loose, nodding, its branches to 5-10 cm long, 2-3 times as long as the spikelets, strongly-flexuous, drooping, scabrous, in 1's-5's, each bearing 1-3 spikelets; spikelets more or less tinged with purple or green, (2) 2.5-4 cm long, 5-9 (12)-flowered, with a hairy rachilla; glumes unequal, acuminate, the lower 0.6-1 cm long, the upper 0.9-1.1 cm long; lemmas lanceolate, 1.2-1.4 cm long, 5-7-nerved, densely pilose on the marginal nerves, short-pilose or scabrous on the midnerve and intermediate nerves, the awn straight, (2.5) 3-6 mm long. July-August. (Plate XLIII, Figure 1, a-e).

Meadows. - East. Siberia: Daur., Len.-Kol. (southeastern part); Far East: Kamch., Sakh., Ud., Okhot., Ze.-Bur., Ussur. Gen. Distr.: North Amer., Jap.-Chin. (Manchuria), Mongolia (eastern part). Described from northwestern America. Type in Berlin.

9. *B. Biebersteinii* Roem. et Schult. Syst. Veget. II (1817) 638. - *B. albidus* M. B. Fl. taur.-Cauc. III (1819) 79; Griseb. in Ldb. Fl. Ross. IV, 357. - *B. angustissimus* C. Koch in Linnaea XXI (1848) 421 (ex Griseb. in Ldb. l. c.).

Perennial. Glaucous plants; rhizome creeping; culms erect, 40-100 cm tall, glaucous, glabrous; sheaths glabrous, occasionally scaberulous only toward the tip, the lower ones dead, partially separating into individual fibers, but not reticulate-fibrillose; culm-leaves flat, 3-7 mm broad, glabrous; basal leaves narrow, often setaceous-conduplicate, acute, stiff. Panicle narrow, long, the branches short; spikelets pale, light green, narrowly lanceolate, 5-8 (11)-flowered, 2.7-3.5 (5) cm long; lemmas lanceolate, 1.2-1.3 cm long, rough with minute appressed bristles, prominently 7-nerved, the awn 3-5 mm long; palea nearly as long as the lemma, bidentate at the apex, short-ciliate on the keels. Anthers orange, to 6 mm long. June-July.

Gravelly slopes. - Caucasus: Ciscauc., Dag., East. Transcauc. Endemic. Described from the mountains in the neighborhood of Tiflis. Type in Leningrad.

10. *B. tomentosus* Trin. in Mém. Acad. Pétersb. VI (1818) 487; Griseb. in Ldb. Fl. Ross. IV, 357. - *B. persicus* Boiss. in Kotschy pl Pers. bor. exs. No 470, 533. - Ic.: Trin. l. c., tab. 9.

Perennial. Rhizome creeping; culms erect, not crowded, to 80 cm tall, velutinous, enveloped at the base by dead, entire, light-tawny-colored sheaths; leaves subinvolute to subplane, velutinous-tomentose, grayish-green; sheaths velutinous; ligule very short. Panicle narrow, contracted, to 18 cm long, the erect, slender, scabrous branches in 2's-4's, each bearing 1-2 spikelets; spikelets 5-10-flowered, pale green, 2-3.5 cm long, glabrescent, oblong-lanceolate, laterally compressed; glumes somewhat unequal, lanceolate, subobtusate, the lower 0.6-1 cm long, the upper 0.8-1.2 cm long; lemmas lanceolate, rough on the 5 nerves with very minute appressed prickly bristles, 0.9-1.2 cm long, the awn straight, 2-3 mm long. June-July.

Subalpine zone. - Caucasus: South. Transcauc. (recorded for Armenia). Gen. Distr.: Iran. Described from the Hilyan Province (Persia). Type in Leningrad.

11. *B. tyttrolepis* Nevski in Herb. Fl. As. Med. No 509 (1934). - *B. erectus* Roshev. in A. H. P. XXXVIII (1924) 129, non Huds.

Perennial. Densely tufted; culms 50-90 cm tall, puberulent below the nodes and below the inflorescence, rarely glabrescent, enveloped at the base by dead, entire, tawny sheaths; leaves narrowly linear, flat, to 5 mm broad, grayish-green, densely pilose, scabrous on the margin; sheaths puberulent; ligule 1.5 mm long, notched. Panicle narrow, contracted, many-flowered, 7-15 cm long, axis pubescent, branches scabrous, in 2's-4's (6's), each bearing 1-2 spikelets; spikelets narrow, linear-lanceolate, pale green, sometimes faintly purple-tinged, 5-11-flowered, 2-2.5 cm long; glumes unequal, the lower 0.5-0.6 cm long, the upper 0.7-0.75 cm long; lemmas 0.8-0.9 cm long, 5-7-nerved, glabrous, scabrous, the awn short, 2-3 mm long. June-July. (Plate XLIII, Figure 7, a-c).

Bare slopes. - Centr. Asia: Dzung. - Tarb., Tyan'-Shan, Pam. - Al. Endemic. Described from western Tyan'-Shan. Type in Leningrad.

NOTE. Belongs to the same series as *Bromus stenostachys* Boiss., described from Afghanistan, but differs from it in the many-flowered panicle, with pubescent axis and scabrous branches.

- 564 12. *B. adjaricus* Somm. et Lev. in A. H. P. XII (1893-94) 51. - *B. variegatus* var. *pubescens* Trautv. ex Grossh. Fl. cauc. I (1929) 123. - Ic.: A. H. P. XVI (1900) tabl XLVII.

Perennial. Rhizome short. Densely tufted; culms erect, or sometimes geniculate in lower part, (25) 30-50 cm tall, covered with short, soft hairs; sheaths velutinous, the lower ones dead, slightly separating into individual fibers; ligule short, lacerate; basal leaves narrow, attaining on the average 1/3 the length of culms; culm-leaves flat, 3.5-5 cm long, 3-4.5 mm broad; all leaves pubescent. Panicle strongly contracted, ovoid or broadly ovoid in outline, more rarely narrow in poorly developed specimens, ca. 5 cm long; spikelets dark purple, 3-6-flowered, pubescent, 2-2.3 cm long (including awns); glumes pilose, strongly acuminate; lemmas 0.9-1 cm long, faintly 7-nerved, covered all over with short hairs, the awn nearly as long as the lemma (0.7-0.8 cm), very slightly bent or straight; palea lanceolate, terminating in 2 sharp teeth, with soft hairs on the keels; anthers yellow, 4 mm long. June-July.

Alpine meadows. - Caucasus: South., East., and West. Transcauc., Ciscauc., Dag. Endemic. Described from Adzhariya (Khandi Range). Type in Florence, cotype in Leningrad.

13. *B. variegatus* M. B. Fl. taur.-cauc. III (1819) 79; Griseb. in Ldb. Fl. Ross. IV, 356; Shmal'g. Fl. II, 647.

Perennial. Tufted; culms 25-70 cm tall, glabrous and smooth, surrounded at the base by dead tawny sheaths which are entire or slightly separating into individual fibers; leaves narrowly linear, 4-5 mm broad, green, flat, glabrous or, more rarely, somewhat hairy on the upper surface, scabrous on the margin and on the upper surface; upper sheaths glabrous and smooth, the lower ones sometimes pilose; ligule obtuse, serrate at the top. Panicle rather contracted, 5-11 cm long, its branches slender, scabrous, subflexuous, in 2's-4's, each bearing 1-2 spikelets; spikelets dark-purple-striped (the upper part of lemma purple-tinged, with a golden membranaceous fringe, the lower part greenish, hence spikelets motley-colored), 1.7-2 (2.3) cm long, 5-7-flowered; glumes linear-acuminate, somewhat unequal, 0.7-1 cm long; lemmas slightly roughened

with minute, barely perceptible, appressed bristles, occasionally glabrescent, 0.9–1.1 cm long, lanceolate, the awn straight, (5) 6–10 mm long. July.

Alpine meadows. –Caucasus: Ciscauc., Dag., East., West., and South. Transcauc. Endemic. Described from eastern Caucasus, Kubinskii Raion. Type in Leningrad.

ECONOMIC IMPORTANCE. One of the best forage plants of the sub-alpine and alpine zones of the Caucasus. Readily eaten by all kinds of livestock; recovers well after grazing.

- 565 14. *B. turkestanicus* Drob. in Fedde, Repert. sp. nov. XXI (1928) 37.

Perennial. Densely tufted; culms 30–85 cm tall, wrapped at the base in dead, brownish-tawny, entire or somewhat split sheaths, glabrescent; leaves green, to 4 mm broad, flat or subinvolute, densely pilose, more rarely covered with sparse, scattered hairs, sometimes glabrescent; ligule 1–2 mm long, obtuse, serrate; leaf sheaths densely pilose, more rarely glabrescent. Panicle open before anthesis, contracted after flowering, few-flowered, containing (2) 5–6 (8) spikelets, narrow, 7.5–15 cm long, axis and branches usually destitute of pubescence; branches in 1's–2's (rarely 3's), each bearing a solitary spikelet (rarely 2 spikelets); spikelets greenish-purple, linear-lanceolate, 2–3.7 cm long, 0.4–0.7 cm broad, (5) 6–10-flowered; glumes lanceolate, acuminate, glabrous, unequal, the lower 0.8–1 cm long, the upper 1–1.2 cm long; lemmas broadly lanceolate, roughened with minute prickles, 5–7-nerved, 1.1–1.3 cm long, bidentate at the base of the awn; awn straight, 3–6 mm long. July–August.

Stony high-mountain slopes. –Centr. Asia: Pam.–Al. (Kugitang, Zeravshan, Gissar), Tyan'-Shan (western part). Endemic. Described from mountains near Tashkent. Type in Tashkent.

15. *B. Paulsenii* Hack. ex Paulsen in Kjoeb. Vidensk. Meddel. (1903) 174. –*B. tomentosus* Roshev. in A. H. P. XXXVIII (1924) 128, non Trinius.

Perennial. Densely tufted; culms 15–40 cm tall, wrapped at the base in dead, brownish-tawny, entire or somewhat split sheaths, usually geniculate, finely pilose throughout their length; leaves grayish-green, densely tomentose-pubescent, flat or subinvolute, to 4 mm broad; leaf sheaths velutinous-tomentose or usually covered with long, retrorse hairs; ligule 1–2 mm long, obtuse, serrate. Panicle open before anthesis, finally broadly oval, more contracted, containing 5–11 spikelets, the axis and sometimes the branches more or less pubescent, the branches in 1's–2's (rarely 3's), each bearing 1 (2) spikelets; spikelets greenish-purple, lanceolate, 2–2.5 cm long, 0.5–0.9 cm broad, usually 5–7-flowered; glumes lanceolate, acuminate, glabrous, unequal, the lower ca. 0.8 cm long, the upper ca. 1 cm long; lemmas broadly lanceolate, roughened minute bristles, 5–7-nerved, 1–1.1 cm long, bidentate at the base of the awn; awn 3–5 mm long. July–August.

Stony high-mountain slopes. –Centr. Asia: Pam.–Al. (Shugnan, Pamir). Endemic. Described from Yashil'kul' Lake area. Type in Vienna, cotype in Leningrad.

16. *B. angrenicus* Drob. in Fedde, Repert. sp. nov. XXI (1925) 38.

566 Perennial. Rhizomatous, tufted; culms 20-30 (35) cm tall, geniculate, perfectly glabrous, wrapped at the base in old, dead, tawny sheaths more or less separating into individual fibers; leaves green, to 2 mm broad, short, flat, or subinvolute, glabrous, scabrous; leaf sheaths glabrous and smooth; ligule short, obsolete. Panicle 5-6 (8) cm long, contracted, spiciform, the branches spreading only prior to anthesis; branches scabrous, in 1's-2's, each bearing a solitary spikelet, the branches often not longer than the spikelets. Spikelets greenish-purple, sometimes very faintly glaucous, 7-5-flowered, (1.8) 2-2.5 cm long; glumes lanceolate, acuminate, the lower 0.6-0.7 cm long, the upper 0.7-0.9 cm long and broader; lemmas lanceolate, 1-1.1 cm long, roughened with minute bristles, the awn straight or very slightly bent, 0.3-0.5 cm long. July.

Mountain slopes. - Centr. Asia: Tyan'-Shan Endemic. Described from the former Tashkent rural district, Arrasan in the valley of Angren. Type in Tashkent.

17. *B. pamiricus* Drob. in Fedde, Repert. sp. nova. XXI (1925) 38. - *B. erectus* var. *uninodis* Hack. in A. H. P. XXVI (1906) 56. - *B. Paulseni* Roshev. ex parte, non Hack.

Perennial. Rhizomatous, tufted; culms 20-40 cm tall, glabrous, wrapped at the base in dead, pale tawny sheaths which are entire or separated into individual fibers; leaves short-pubescent, to 3 mm broad, flat or in-rolled at the margins, glaucous-green; sheaths glabrous, minutely scabrous; ligule 2 mm long. Panicle 9-10 cm long, broadly oval, open, its branches scabrous, in 2's-4's, 2-3 times as long as the spikelets, each branch bearing a solitary spikelet; spikelets greenish-purple, 1.6-2 cm long, 4-7-flowered; glumes strongly tapering to an awn-point, glabrous, the lower 0.6-0.8 cm long, 1-(3)-nerved, the upper 0.8-1 cm long, 3-(5)-nerved; lemmas 0.9-1 cm long, lanceolate, scabrous due to minute bristles, the awn straight, 3-4 mm long. June-August.

Stony mountain slopes. - Centr. Asia: Pam. - Al. Endemic. Described from Pamir (Langar). Type in Leningrad.

18. *B. riparius* Rehm, Notiz. Veg. Gest. Schwarz. Meer. (1872) 83. - *B. fibrosus* Hack. in Oesterr. B. Z. XXIX (1879) 209. - *B. transilvanicus* Schur in Oesterr. B. Z. (1860) 237, non Steud. Sun. I (1855) 320. - *B. erectus* auct. fl. Ross., non Huds. - Exs.: Fl. austr. - hung. No 3944.

Perennial. Densely tufted; rhizome short-creeping culms 30-95 cm tall, enveloped at the base by dead, reticulate-fibrillose sheaths; leaves scabrous, narrowly linear, to 20-25 cm long, the margin of the blade vested with often deciduous cilia; sheaths more or less covered with spreading long hairs; ligule very short, lacerate. Panicle rather loose, 10-15 cm long, its branches scabrous, each bearing 1-2 spikelets; spikelets lanceolate, 5-7-flowered, 2.5-3.5 cm long, greenish, more rarely purple-tinged; glumes unequal, the lower 0.8-1 cm long, the upper 0.9-1.2 cm long; lemmas lanceolate, somewhat pubescent or glabrescent, 5-7-nerved, 1.1-1.2 (1.3) cm long, the awn straight, 5-8 mm long. May-July.

567 Dry, often stony, slopes, steppe meadows, steppes. - European part: Crimea, Black Sea Region, Mid. Dnep., Volg. - Don, Upp. Volg., Volg. - Kam. (southern Ural), Trans-Volga Region, Low. Don, Low. Volg.; Caucasus: Ciscauc., Dag., West., East., and South. Transcauc. Gen. Distr.: Centr. Eur., Balk. - Asia Min. Described from environs of Odessa. Co-type in Leningrad.

NOTE. Collected as an introduced plant near Pakov and in the Ussuri region.

ECONOMIC IMPORTANCE. Inferior to smooth brome as regards nutritive value, but readily eaten by livestock. In certain regions of the U.S.S.R. (Mid. Volg.) it is likely to be of value in cultivation.

19. *B. tometellus* Boiss. Diagn. ser. 1, VII (1846), 126.

Perennial. Tufted; culms 50-60 cm tall, enveloped at the base by reticulate-fibrillose dead sheaths; lower leaves sparsely short-pubescent and also covered with long, white, setiform hairs, rarely glabrescent, flat or subinvolute; ligule short; sheaths of lower leaves sparsely covered with setiform hairs. Panicle erect, 9-10 cm long, few-flowered, rather contracted, the branches as long as the spikelets or shorter, straight, in 1's-2's (3's), rough owing to a dense cover of short, setiform hairs. Spikelets pale, 6-10-flowered, (3) 3.5-5 (5.5) cm long; lower glume 0.95-1.4 cm long, the upper 1-1.6 cm long, both narrowly lanceolate, elongate-acuminate; lemmas lanceolate, obscurely 5-nerved, 1.3-1.8 cm long, roughened with appressed, very minute, prickly bristles, produced into a divergent awn and sharply 2-toothed below it; the awn 1-1.4 cm long, as long as its lemma. May-June. (Plate XLIII, Figure 2).

Stony slopes. -Caucasus; South. Transcauc. Gen. Distr.: Balk. -Asia Min. (eastern part), Arm. -Kurd., Iran. Described from town of Kikh-barfi, near Shiraz. Type in Geneva, cotype in Leningrad.

20. *B. kopetdagensis* Drob. in Fedde, Repert. sp. nov. XXI (1925) 38. -*B. tomentellus* auct. fl. turkest., non Boiss. Diagn. ser. VII (1846) 126. -*B. tomentellus* var. *subglaber* Roshev. in herb. Ac. Sc. URSS.

Perennial. Tufted; culms to 75-90 cm tall, glabrous, enveloped at the base by pale-grayish-tawny, reticulate-fibrillose sheaths of old, dead leaves; leaves linear, subinvolute, scabrous and occasionally ciliate on the upper surface and on the margin, to 4 mm broad; sheaths of the glaucous-green leaves glabrous, rarely somewhat puberulent; ligule obtuse, notched, to 2 mm long. Panicle contracted, 9-15 cm long, few-flowered, its branches scabrous, usually arranged in pairs and bearing solitary spikelets; spikelets pale green, lanceolate, 2.5-3.5 (4) cm long, (5) 7-9- (11)-flowered; glumes acuminate, the lower 1-1.3 (1.4) cm long, the upper 1.2-1.5 cm long; lemmas lanceolate, 5-7-nerved, 1.3-1.6 cm long, roughened with tiny prickles, bidentate at the base of the awn; awn 3-5 mm long, straight or subdivergent; palea 1-1.2 cm long. June-July. (Plate XLIII, Figure 6).

568 Stony mountain slopes. -Centr. Asia: Upp. Turkm. Endemic. Described from the slopes of Kopet Dag, facing Ashkhabad. Type in Tashkent.

21. *B. cappadocicus* Boiss. et Bal. in Bull. Soc. Bot. Fr. IV (1857) 306; Diagn., ser. 2, IV (1859) 140.

Perennial. Densely tufted; culms slender, 25-45 cm tall, enveloped at the base by dead, tawny, reticulate-fibrillose sheaths; leaves short, narrowly linear, flat or subinvolute, glabrescent or covered with scattered hairs, those of the culm 1.5-3.5 cm long and to 1.5 mm broad. Panicle erect, oval, 5-9 cm long, its branches very slender, flexuous, drooping, in 2's-3's (rarely solitary), each bearing 1-2 spikelets; spikelets small, 1.7-2 (2.5) cm long (including awns), 5-6-flowered, greenish, faintly purple-tinged; glumes slightly unequal, the lower 0.5-0.7, the upper 0.7-0.8 cm long, acuminate; lemmas lanceolate, finely pilose, 0.8-1 cm long, awned; awn shorter than the lemma, 0.4-0.6 cm long.



Dry slopes. -European part: Crimea. Gen. Distr.: Balk. -Asia Min. (Asia Minor). Described from the environs of Keiser'. Type in Geneva.

Subgenus II. *STENOBROMUS** Griseb. Spicil. fl. Rumel. II (1844) 448. -Spikelets enlarged toward the apex. Lower glume 1-nerved, upper glume 3-nerved. Lemma with straight or divaricately bent awn. Annual plants.

- 571 1. Lower glume 3-nerved, upper glume 5-nerved 27. *B. sericeus* Drob.
+ Lower glume 1-nerved, upper glume 3-nerved 2.
2. Culm below the inflorescence, as well as inflorescence axis and branches, glabrous; lemmas narrowly lanceolate 3.
+ Culm below the inflorescence and inflorescence parts pilose; lemmas broadly lanceolate 4.
3. Panicle broad, open, with branches to 10 cm long 22. *B. sterilis* L.
+ Panicle contracted, pointing upwards or sideways, its branches shorter than the spikelets 23. *B. madritensis* L.
4. Upper glume 20 mm long; lemmas to 20-25 mm long 24. *B. rigens* L.
+ Upper glume 10-12 mm long; lemmas 10-15 mm long 5.
5. Spikelets crowded in an erect, capitate inflorescence, subsessile 25. *B. rubens* L.
+ Spikelets disposed in a 1-sided, nodding panicle, borne on rather long, flexuous pedicels 26. *B. tectorum* L.

Series 1. Steriles V. Krecz. et Vved. -Inflorescence branches glabrous, scabrous; sheaths puberulent. Spikelets 4-6 cm long; lemmas ca. 2 cm long, linear-lanceolate.

22. *B. sterilis* L. Sp. pl. (1753) 77. -*B. amplius* C. Koch in Linnaea, XXI (1848). -Exs.: Kneuck, No. 287.

Annual. Culms 30-70 cm tall; leaves linear, 2-5 mm broad, blades and sheaths short-pilose. Panicle to 20 cm long, very loose, its branches very

* Subgenera II *Stenobromus*, III *Nevskiella*, and IV *Zecobromus* have been compiled by V. I. Krecbetovich and A. I. Vvedenskii. - A critical study of brome grasses by S. A. Nevskii (Schedae ad Herb. Fl. As. Med. XXI (1934) has recently appeared, and interested readers are referred to it.

Explanation to Plate XLIII

1. *Bromus Richardsonii* Link: a) lodicules; b) and c) lower and upper glume; d) and e) lemma and palea. -2. *B. tomentellus* Boiss., spikelet. -3. *B. sibiricus* Drob. -4. *B. ornans* Komarov: a) and b) lower and upper glume; c) and d) lemma and palea. -5. *B. irkutensis* Komarov: a) and b) lower and upper glume; c) and d) lemma and palea. -6. *B. kopetdagensis* Drob., culm bases enveloped by reticulate-fibulose sheaths. -7. *B. tytholepis* Nevskii: culm bases with entire sheaths; a) and b) lower and upper glume; c) lemma. -8. *Littledalea altaica* (Korth.) V. Petr.: a) and b) lower and upper glume; c) and d) lemma and palea; e) lodicules.

long, scabrous, drooping, each bearing 1-2 spikelets; spikelets 5-(10)-flowered, 4-6 cm long including awns; lower glume linear (subsubulate), very sharply pointed, ca. 10 mm long, the upper nearly 1 1/2 times longer; lemmas linear-lanceolate, ca. 2 cm long, awned from below the very sharply pointed, bifid apex, the awn straight, 1 1/2 times as long as its lemma; anthers ca. 3/4 mm long. April-June. (Plate XLII, Figure 2).

Fields, roadsides, weedy places; in the south in oases (in shade). - European part: Mid. Dnep., Black Sea Region, Low. Don., Crimea; Caucasus: all regions; Centr. Asia: Syr-Dar., Pam.-Al., Upp. Turkm. Gen. Distr.; Scand. (southern part), Centr. and Atl. Eur., Medit., Balk.-Asia Min. Arm.-Kurd., Iran. Described from southern Europe. Type in London.

ECONOMIC IMPORTANCE. Considered a good forage grass.

23. *B. madritensis* L. Amoen. acad. IV (1859) 265. - Exs.: Kneuck. No 288.

Annual. Culms 10-30 (-50) cm tall, glabrous or sparsely pilose in upper part; leaves linear, to 7 mm broad, blades and sheaths pilose. Panicle erect, its branches short, (not exceeding the spikelets), scabrous, each bearing 1-4 spikelets; spikelets glabrous or pubescent, 5-12-flowered, 5-6 cm long including awns; lower glume linear-lanceolate, very sharply pointed, 9 mm long, the upper 1 1/2 times longer; lemmas linear-lanceolate, with faint lateral nerves, ca. 20 mm long; awned from below the bifid apex, the awn somewhat spreading in maturity, about as long as the lemma. April-June.

572 Dry slopes; also as a weed. - European part: Crimea. Gen. Distr.: Medit., Balk.-Asia Min., Arm.-Kurm., Iran. Described from Spain. Type in London.

Series 2. *Rigentes* V. Krecz. et Vved. - Culms below the inflorescence and inflorescence branches pubescent. Upper glume 2 cm long. Spikelets 6-8 (10) cm long. Lemmas ca. 3 cm long, broadly lanceolate toward the base.

24. *B. rigens* L. Mant. I (1767) 33. - *B. rigidus* Roth in Roem. ex Uster. Bot. Mag. X (1790) 21.

Annual. Culms 30-40 cm tall, pubescent in upper part; leaves linear, 4-5 mm broad, blades and sheaths pilose. Panicle to 20 cm long, erect, loose, somewhat contracted or open, its branches much shorter than the spikelets, short-pilose, clavate below the spikelets, each bearing 1-2 spikelets; spikelets glabrous, more rarely pubescent, 6-8-flowered, 6-8 (10) cm long including awns; lower glume linear-lanceolate, very acute, scabrous on the keel, ca. 2 cm long, the upper 1 1/2 time longer; lemmas linear-lanceolate, prominently nerved, ca. 3 cm long, awned from below the sharply bifid apex, the awn straight (scarcely spreading in maturity), stout, twice as long as the lemma; Palea 2/3 the length of lemma; anthers ca. 1 mm long. May-June. (Plate XLII, Figure 4 a).

Sandy banks; also as a weed. - European part: Crimea; Caucasus: East. Transcauc. (Apsheron). Gen. Distr.: Atl. Eur., Medit., Balk.-Asia Min. Described from Portugal. Type in London.

Series 3. *Rubentes* V. Krecz. et Vved. - Culms below the inflorescence and inflorescence branches pubescent. Upper glume 10-12 mm long; spikelets 2-4 cm long; lemmas 10-15 cm long.

25. *B. rubens* L. Amoen. acad. IV (1759) 265. - *B. ovatus* Gaertn. in Nov. Comm. Acad. Petrop. XIV (1770) 537.

Annual. Culms 15-30 cm tall, pubescent in upper part; leaves linear, 2-4 mm broad, blades and sheaths pilose. Panicle to 10 cm long, dense, contracted, erect, its short branches (much shorter than the spikelets) short-pilose, each bearing 1-3 spikelets; spikelets pubescent, 4-8 (10)-flowered, 3-4 cm long including awns; lower glume linear-lanceolate, very acute, ca. 7 mm long, upper glume lanceolate, nearly 1 1/2 times as long; lemmas lanceolate, ca. 15 mm long, awned from below the sharply bifid apex, the awn straight, slightly spreading in maturity, somewhat longer than its lemma; anthers ca. 3/4 mm long. March-June.

573 Dry mountain slopes and sandy places; also as a weed. - Caucasus: East. Transcauc. (Apsheeron); Centr. Asia: Kara-Kum (Krasnovodsk, Chikishliyar), Upp. Turkm. (Karakala). Gen. Distr.: Mediterranean. Described from Spain. Type in London.

26. *B. tectorum* L. Sp. pl. (1753) 77. - *B. madritensis* var. *caucasicus* Hack. in Monit. Jard. Tiflis, 29 (1913) 36. - Ic.: Syreishchikov, Ill. Fl. Mosk. gub. (Ill. Fl. Moscow Province) I, 154. - Exs.: Kneuck. No 289; HFR No 598.

Annual. Culms 15-40 cm tall, pubescent below the panicle; leaves linear, 2-5 mm broad, blades and sheaths pilose. Panicle to 15 cm long, dense, 1-sided, nodding, branches short-pilose, the lower ones bearing several spikelets each; spikelets pubescent, 5 (10)-flowered, 2-3 cm long including awns; lower glume linear-lanceolate, acute, 6-8 mm long, upper glume lanceolate, 1 1/2 times as long; lemmas lanceolate, ca. 12 mm long, awned from below the sharply bifid apex, the awn straight, about as long as its lemma; palea much shorter; anthers 0.7 mm long. April-June.

Consolidated sands; usually as a weed. - European part: in all regions (except the north and Arctic); Caucasus: all regions; Centr. Asia: all regions. Gen. Distr.: Europe, Medit., Balk. - Asia Min., Arm. - Kurd., Iran, and North America. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. In dry steppes and deserts, especially on light soils, it is often the principal spring forage plant. It ought to be studied with a view to introduction into cultivation.

Series 4. *Sericeae* V. Krecz. et Vved. - Lower glume 3-nerved, upper glume 5-nerved.

27. *B. sericeus* Drob. in Fedde, Repert. sp. nov. XXI (1925) 39. - *Bromus tectorum* var. *grandiflorus* Hack. in Herb. Sintensis No 2237.

Annual. Culms 20-35 cm tall; leaves linear, 2-4 mm broad, blades and sheaths pilose. Panicle to 10 cm long, 1-sided, nodding; branches slender, reflexed, scabrous or short-pilose, shorter than the spikelets, each bearing 1-2 spikelets; spikelets 5-8-flowered, pubescent, sericeous, 3-5 cm long including awns; lower glume 3-nerved, linear-lanceolate, very broad, ca. 12 mm long, upper glume 5-nerved, lanceolate, much longer than the lower; lemmas linear-lanceolate, 15-20 mm long, awned from below the sharply bifid apex, the awn about as long as its lemma; palea much shorter than the lemma; anthers ca. 1 mm long. March-May. (Plate XLII, Figure 7).

Casual, on sandy soils. - Centr. Asia: Syr-Dar. (in areas of appearance of motley-colored strata), Kara-Kum, Upp. Turkm., Pam. - Al. (near

Baisun). Endemic. Described from Uzbekistan and Turkmenistan. Type in Tashkent.

Subgenus III. NEVSKIELLA V. Krecz. et Vved. - Spikelets small, ovate. Glumes subulate-acuminate, the lower 1-nerved, the upper 3-nerved. Awn straight, 4-5 times as long as its lemma. Annual plants.

- 574 28. *B. gracillimus* Bge. in Mém. Ac. Pétersb. sav. étrang. VII (1851) 527. - *B. crinitas* Boiss. et Hoh., Diagn., ser. 1, XIII (1853) 64. - *Deschampsia aralensis* Rgl. in Bull. Soc. Nat. Mosc. XLI, 2 (1862) 300.

Annual. Culms 10-40 cm tall; leaves linear, 2-4 mm broad, blades and sheaths short-pilose. Panicle to 10 cm long, erect, loose, its branches very long, slender, each bearing 1-3 spikelets; spikelets ovate, 3-4-flowered, very small, 5-10 mm long; lower glume lanceolate, very acute, ca. 3 mm long, upper glume oblong-lanceolate, acute, much longer than the lower, nearly reaching the tip of the lowest floret; lemmas elliptical-lanceolate, ca. 5 mm long, obscurely nerved, awned from below the obtuse, scarcely bifid apex, awn very long, several times the length of its lemma, slender, straight; palea as long as the lemma; anthers ca. 0.5 mm long. March-May. (Plate XLII, Figure 6 a).

Sands, bare places. - Centr. Asia: all regions. Gen. Distr.: Iran. Described from Kizyl-Kum. Type in Paris.

Subgenus IV. ZEOBROMUS Griseb. Spicil. Fl. Rumel. II (1844) 449. - Spikelets attenuate toward the apex. Lower glume 3-5-nerved, the upper 5-7-nerved. Lemmas with a short, straight or twisted, divaricate awn. Annual plants.

1. Anthers 4 mm long; spikelets usually narrow, purple-tinged. 30. *B. arvensis* L.
- + Anthers not exceeding 2-2.3 mm in length; spikelets usually green 2.
2. In maturity lemmas of one row do not overlap with those of the adjacent row, so that their pedicels are visible and the spikelets along the central line show through 29. *B. secalinus* L.
- + In maturity lemmas of one row overlap with those of the adjacent row, without any gaps between them 3.
3. Panicle rather diffuse, with drooping branches and spikelets, the branches usually much longer than the spikelets or, when of same length, then spikelets awnless or with awns not exceeding 1-2 mm 4.
- + Panicle contracted, with erect branches and spikelets, the branches usually shorter than the spikelets 10.
4. Lower glume ca. 9 mm long. Lemma 12-15 mm long; palea 2/3 the length of lemma. 42. *B. oxyodon* Schrenk.
- + Lower glume at most 7 mm long; lemma at most 11 mm long; palea as long as the lemma or more than 2/3 of its length 5.
- 575 5. Lemmas obtuse, awnless or with a very short awn, not exceeding 2 mm in length 31. *B. briziformis* Fisch. et Mey.
- + Awn as long as the lemma or longer 6.
6. Awns of the lower florets in the spikelet shorter than those of the upper florets, mostly divergent in maturity 7.
- + Awns of all florets in the spikelets of approximately equal length, straight in maturity 9.

7. Panicle 1-sided, the branches usually straight; spikelets ovate-oblong; lemmas prominently angular at the margins 32. *B. squarrosus* L.
- + Panicle open, the lower branches usually bearing several spikelets; spikelets lanceolate or oblong-lanceolate; lemmas not angular or faintly angular at the margins 8.
8. Spikelets oblong-lanceolate, pubescent; lemmas 10-11 mm long, faintly angular at the margins 33. *B. anatolicus* Boiss. et Heldr.
- + Spikelets lanceolate; lemmas 8-9 mm long, not angular at the margins 34. *B. japonicus* Thbg.
9. Lemmas angular at the margins; palea slightly shorter than the lemma 35. *B. commutatus* Schrad.
- + Lemmas angular at the margins; palea as long as the lemma 36. *B. racemosus* L.
10. Awns straight, remaining so in maturity 11.
- + Awns spreading subhorizontal in maturity 13.
11. Lemmas narrowly elliptical, 9-10 mm long; upper glume 2.5 mm broad; awn slightly longer than the lemma 39. *B. Severtzovii* Rgl.
- + Lemmas oblong-elliptical, 6-9 mm long; upper glume 4-4.5 mm broad; awn as long as or shorter than the lemma 12.
12. Spikelets pubescent; lemmas 8-9 mm long; awn about as long as the lemma 37. *B. mollis* L.
- + Spikelets glabrous; lemmas 6-7 mm long; awn much shorter than the lemma 38. *B. Popovii* Drob.
13. Spikelets 1.5-2 cm long; lemmas 7-10 mm long, always with 1 awn 14.
- + Spikelets usually 2-4 cm long; lemmas (11)-12-15 mm long 15.
14. Panicle subsecund, few-flowered. Lemmas 10 mm long, awned from the upper one-third 40. *B. gracilis* M. et Pop.
- + Panicle dense, contracted, erect, ovoid or oblong. Lemmas 7-9 mm long, awned from the upper 1/4 41. *B. scoparius* L.
- 576 15. All lemmas in the spikelet 1-awned, except the topmost (neuter ?) ones which occasionally have weak, straight lateral awns. Spikelets subterete, lanceolate 43. *B. macrostachys* Desf.
- + All lemmas in the spikelet, except the lowest, with 3, usually colored, awns. Spikelets compressed, oblong-lanceolate 44. *B. Danthoniae* Trin.

Series 1. *Secalinae* V. Krecz. et Vved. - Inflorescence an erect panicle, with long branches. Spikelets oblong-conical, their lemmas not overlapping those of the adjacent row (the pedicels visible). Lemmas sub-obtuse, awnless or short-awned.

29. *B. secalinus* L. Sp. pl. (1753) 76. - Ic.: Syreishchikov, Ill. Fl. Mosk. gub. (Ill. Fl. of Moscow Province) I, 155. - Exs.: Kneuck, No 774; HFR No 147.

Annual or biennial. Culms 40-100 cm tall; leaves linear, 3-6 mm broad, glabrous or more rarely pilose, the sheaths glabrous or the lower ones pilose. Panicle to 20 cm long, loose, subunilateral, its branches scabrous, longer than the spikelets; the lower branches sometimes bearing 2-3 spikelets; spikelets oblong-lanceolate, glabrous, or more rarely,

pubescent, 5-15-flowered, (1) 2-2.5 cm long, rachilla evident in fruit between the divergent and somewhat inrolled lemmas and paleas; lower glume lanceolate, subacute, ca. 5 mm long, upper glume oblong, obtuse, coriaceous, obscurely nerved, not angular at the margin, 8-10 mm long, awned from below the entire or obscurely bifid apex, the awn slender, sometimes as long as its lemma, occasionally lacking; palea as long as the lemma; anthers 2 mm long. June-July. (Plate XLII, Figure 8)

A weed of cultivated fields. -European part: all rye-growing regions; West. Siberia: Upp. Tob., Irt.; Far East: (western) Ussur., Sakh. Gen. Distr.: Western Europe. Described from western Europe. Type in London.

ECONOMIC IMPORTANCE. A weed of rye and oat fields. There are indications that alcohol can be produced from its fairly large seeds. The straw is eaten by livestock.

Series 2. *Macranthera* V. Krecz. et Vved. -Inflorescence spreading, with long branches. Spikelets narrow, lanceolate. Glumes lemmas and paleas lanceolate or oblong-lanceolate. Anthers 4 mm long, linear.

30. *B. arvensis* L. Sp. pl. (1753) 77. -Ic.: Syreishchikov, Ill. Fl. Mosc. gub. (Ill. Fl. of Moscow Province) I, 155. -Exs.: Kneuck, No 162 and 162a; HFR No 146.

Annual or biennial. Culms 30-100 cm tall; leaves linear, to 6 mm broad, blades and sheaths pilose. Panicle broad, loose, to 30 cm long, finally nodding, more or less purple-tinged; branches scabrous, very long, slender, mostly bearing several spikelets (about 7 each); spikelets lanceolate, glabrous, 5-10- (rarely more)-flowered, (1) 1.5-2.5 cm long; lower glume lanceolate, keeled, acute, ca. 4 mm long, upper glume oblong-lanceolate, somewhat longer than the lower; lemmas oblong-lanceolate, some 577 8 mm long, subangular at the margin, awned from below the sharply bifid apex; awn straight, as long as the lemma; lemma and palea divergent in fruit; palea as long as the lemma; anthers 4 mm long. May-July.

A weed of fields and roadsides. -European part: all regions; Siberia: all regions (except Arctic); Caucasus: all regions; Centr. Asia: (only in northern part - adventitious); Far East: Ussur. Gen. Distr.: West. Eur., Medit., Balk. -Asia Min. (to Persia). Described from western Europe. Type in London.

ECONOMIC IMPORTANCE. A weed, especially on calcereous soils.

Series 3. *Squarrosae* V. Krecz. et Vved. -Inflorescence rather open. Awns of the lower florets in a spikelets shorter than those of the upper florets, or spikelets awnless. Anthers ca. 1 mm long.

31. *B. briziformis* Fisch. et Mey. Ind. Sem. Hort. Petrop. III (1837) 30. -*B. squarrosus muticus* C. A. Mey. Ind. cauc. (1831) 21. -Exs.: Kneuck, No 775; HFR No 1047.

Annual. Culms 20-40 cm tall; leaves linear, 2-5 mm broad, blades and sheaths pilose. Panicle to 10 cm long, loose, 1-sided, nodding, few-flowered; branches oblong, as long as the spikelets or slightly longer; spikelets ovate or oblong-ovate, laterally much compressed, 10-20-flowered, 1.5-2.5 cm long, to 12 mm broad; lower glume oblong-lanceolate, obtuse, ca. 5 mm long, upper glume oblong, longer than the lower; lemmas broadly obovate-rhomboidal, strongly angular at the margin, subacute, 7-9 mm long, awnless or minutely awned; palea much shorter than the lemma; anthers ca. 1 mm long. May-June. (Plate XLII, Figure 3 a).

Meadows and coppices. -Caucasus: east. Transcauc., Tal.; East. Asia: (introduced), Upp. Turkm. (Firyuza, Karakla). Gen. Distr.: Northern Persia. Described from Talysh. Type in Leningrad.

32. *B. squarrosus* L. Sp. pl. (1753) 76. -*B. wolgensis* Fisch. in Jacq. Ecl. Gram. (1813) 20, tab. 15. -Exs.: Kneuck. No 165; Dörfl. No 4598.

Annual or biennial. Culms 30-60 cm tall; leaves linear, 2-4 mm broad, blades and sheaths pilose. Panicle to 20 cm long, loose, 1-sided, nodding; branches scabrous, long, usually straight; spikelets ovate-oblong, strongly laterally compressed, glabrous or often pubescent, 8-25-flowered, to 5 cm long and 1 cm broad; lower glume oblong-lanceolate, acute, ca. 5 mm long, upper glume oblong, much longer than the lower; lemmas obovate, strongly angular at the margin, 8-9 mm long, awned from below the sharply bifid apex; awn much longer than the lemma, finally strongly divergent, twice-bent; palea much shorter than the lemma; anthers ca. 1 mm long. June-July.

578 Desert zone; also as a weed. -European part: Mid. Dnep., Black Sea Region, Volg. -Don, Low. Don, Upp. Volg., Volg. -Kam. (south), Trans-Volga Region, Low. Volg., Crimea; Caucasus: Ciscauc., Dag., West. Transcauc. (north-west), East. Transcauc.; West. Siberia: Alt.; Centr. Asia: (in the south, introduced, infrequent), Aral. -Casp., Balkhash Region, Dzung. -Tarb., Syr-Dar., Tyan'-Shan, Pam. -Al. Gen. Distr.: Mediterranean, Near Asia, and introduced in West. Europe and Asia. Described from France. Type in London.

ECONOMIC IMPORTANCE. A weed, in spring readily eaten by livestock in the steppe regions; of no economic importance on account of scattered growth.

33. *B. anatolicus* Boiss. et Heldr. Diagn., ser. 1, XIII (1853) 63.

Annual. Culms 30-70 cm tall; leaves linear, 3-5 mm broad, blades and sheaths pilose. Panicle to 15 cm long, loose, open, branches drooping, reflexed, scabrous, the lower bearing 2-3 spikelets; spikelets oblong-lanceolate, pubescent, 8-12-flowered, (1.5) 2-3.5 cm long; lower glume oblong-lanceolate, ca. 6 mm long, upper glume oblong, much longer than the lower; lemmas oblong, faintly angular at the margin, 10-11 mm long, awned from below the sharply bifid apex; awn long (much longer than the lemma), finally divergent, twice-bent; palea much shorter than the lemma; anthers ca. 1 mm long.

Dry stony slopes. -European part: Crimea; Caucasus: West. Transcauc. (Black Sea coast). Gen. Distr.: Asia Min. Described from Anatolia. Type in Geneva.

34. *B. japonicus* Thbg. Fl. Japon. (1784) 52, tab. 11. -*B. patulus* Mert. et Koch, Deutschl. Fl. I (1823) 685. -*B. Cyri* Trin. in C. A. Mey. Ind. cauc. (1831) 24. -*B. Abolini* Drob. in Fedde, Repert. sp. nov. XXI (1925) 40. -*B. ugamicus* Drob., ibid. (smut-infected specimens). -Ic.: Syreishchikov, Ill. Fl. Mosk. gub. (Ill. Fl. of Moscow Province) I, 156. -Exs.: Kneuck. No 655; Dörfl. No 5375.

Annual. Culms 20-80 cm tall; leaves linear, to 4 mm broad, blades and sheaths pilose. Panicle to 25 cm long, loose, open, its branches finally drooping, scabrous, very long, the lower ones bearing several spikelets; spikelets lanceolate, glabrous, more rarely pubescent, 8-12-flowered, (1.5) 2-2.5 cm long; lower glume oblong-lanceolate, subacute, ca. 5 mm

long, the upper oblong, subobtuse, much longer; lemmas oblong-lanceolate, not angular or subangular at the margin, 8-9 mm long, awned from below the subobtuse, bifid apex; awn straight, often finally divergent, longer than the lemma; awn of the lower florets shorter; lemmas divergent in maturity; palea much shorter than the lemma; anthers 1 mm long. May-July. (Plate XLII, Figure 10).

Meadow steppes and mountain slopes; also as a weed. - European part: Lad. - Il'm. (Petrozavodsk, Zaonezh'e), Upp. Volg., Volg. - Kam. (south), Mid. Dnep., Volg. - Don., Crimea, Black Sea Region, Low. Don., Low. Volg.; Caucasus: everywhere; Centr. Asia: Aral. - Casp., Balkash Region, Dzung. - Tarb., Tyan'-Shan, Syr-Dar., Kara-Kum, Upp. Turkm. 579 Gen. Distr.: West. Europe, North Africa, Asia (introduced), America (introduced). Described from Japan. Type in Uppsala.

Series 4. *Communitatae* V. Krecz. et Vved. - Plants with rather contracted inflorescences. Spikelets on short, mostly erect branches; awns of all florets in the spikelet equal. Anthers ca. 2 mm long.

35. *B. commutatus* Schrad. Fl. Germ. I (1806) 353. - Exs.: Kneuck. No 754; Dörf. No 5374.

Annual. Culms 30-60 cm tall; leaves linear, 4-5 mm broad, blades and sheaths pubescent. Panicle to 15 cm long, erect, loose, branches slender, scabrous, to 5 cm long, the lower with 2-3 spikelets; spikelets oblong-lanceolate, 5-10-flowered, glabrous, 1.5-2 cm long; lower glume lanceolate, acute, ca. 5 mm long, the upper oblong, subobtuse, slightly longer; lemmas oblong-obovate, angular at the margin, ca. 7 mm long, awned from below the subobtuse, subentire apex, awn straight, slightly longer than the lemma; palea slightly shorter than the lemma; anthers 1.5 mm long. May-June.

European part: possible Upp. and Mid. Dnep., Crimea; Caucasus: (recorded for all regions except South. Transcauc. and Tal). Gen. Distr.: Western Europe. Described from Germany.

36. *B. racemosus* L. Sp. pl. ed. 2 (1762) 114. - Exs.: Kneuck. No 100.

Annual or biennial. Culms 40-60 cm tall; leaves linear, 4 mm broad, blades and sheaths scabrous. Panicle not more than 7 cm long, narrow, erect, ultimately somewhat nodding; branches scabrous, to 3 cm long; spikelets oblong-lanceolate, 5-8-flowered, to 1.5 cm long, mostly purple; lower glume lanceolate, ca. 6 mm long, acute, upper glume oblong-ovate, slightly longer than the lower; lemmas ovate-elliptical, not angular at the margin, ca. 7 mm long, awned from below the bifid apex; awn straight, slightly shorter than the lemma; lemmas closely imbricate; palea shorter than the lemma; anthers 1.5-2 mm long.

Wet meadows, -Caucasus: Ciscauc., West, and East, Transcauc., Tal. Recorded for various localities in the U.S.S.R., the records needing verification. Gen. Distr.: West. Europe. Described from England. Type in London.

37. *B. mollis* L. Sp. pl. ed. 2 (1762) 112. - *B. hordeaceus* auct. Fl. Ross., non L. - Ic.: Syreishchikov, Ill. Fl. Mosk. gub. (Ill. Fl. Moscow Province) I, 156. - Exs.: Kneuck. No 163.

Annual or biennial. Culms 10-80 cm tall; leaves linear, to 5 mm broad, blades and sheaths pilose. Panicle to 10 cm long, erect, rather compact;

branches short, soft-hairy, the lower branches with several spikelets; spikelets rather soft-pubescent, oblong, 6-10-flowered, 1-1.5 (2) cm long; 580 lower glume lanceolate, acute, 6-7 mm long, upper glume broadly oblong, slightly longer than the lower; lemmas oblong-elliptical, not angular at the margin, 8-9 mm long, awned from below the sharply short-bifid apex; awn straight, about as long as the lemma; anthers ca. 2 mm long. May-July.

A weed of fields, railroads, embankments, etc. - European part: everywhere except the Arctic region; Siberia: everywhere except the Arctic; Caucasus: all regions; Far East: Ussur. Gen. Distr.: introduced into all parts of the world. Described from southern Europe. Type in London.

ECONOMIC IMPORTANCE. Infesting stands of forage plants, often crowding them out; produces coarse fodder of low value (sown in leys for early cutting prior to maturing).

38. *B. Popovii* Drob. in Fedde, Repert. sp. nov. XXI (1925) 40. - *B. racemosus* auct. fl. As. Med., non L.

Annual. Culms 15-75 cm tall; leaves linear, or 3 mm broad, blades and sheaths pilose. Panicle to 10 cm (more rarely ca. 7 cm) long, erect, contracted; branches scabrous, longer than the spikelets, the lower branches sometimes bearing 2-3 (6) spikelets; spikelets lanceolate, 6-12-flowered, glabrous, 1-2 cm long; lower glumes lanceolate, acute, ca. 5 mm long, the upper oblong, slightly longer; lemmas oblong-elliptical, slightly angular at the margin, 6-7 mm long, awned from below the obtuse, subentire apex; awn short (much shorter than the lemma), straight; palea much shorter than the lemma; anthers 2-2.3 mm long. May-July.

River valleys. - Centr. Asia: Balkhash Region, Aral. - Casp., Syr-Dar., Amu-Dar., Kyz. - Kum, Pam. - Al. Endemic. Described from Uzbekistan. Type in Tashkent and Leningrad.

Series 5. *Dolicholepides* V. Krecz. et Vved. - Inflorescence crowded, branches shorter than the spikelets. Lemmas 7-10 mm long, linear-lanceolate; awns straight or recurved, about as long as the lemmas. Anthers 0.5-1 mm long.

39. *B. Severtzovii* Rgl. in A. H. P. VII (1881) 601.

Annual. Culms 35-70 cm tall; leaves linear, 3-4 mm broad, blades and sheaths pilose. Panicle to 10 cm long, contracted, erect; branches short-pilose, shorter than the spikelets, bearing 1-3 spikelets; spikelets lanceolate, rather pubescent, 6-10-flowered, 1.5-2 cm long; lower glume linear-lanceolate, very acute, ca. 7 mm long, upper glume lanceolate, acute, slightly longer than the lower; lemmas not angular at the margin, lanceolate, 9-10 mm long, awned from below the sharply bifid apex; awn straight, slightly longer than the lemma; palea slightly shorter than the lemma; anthers ca. 1 mm long. April-May.

Valleys of large rivers, on solonchaks soil. - Centr. Asia: everywhere, except the alpine zone. Described from Golodnaya Steppe. Type in Leningrad.

581 40. *B. gracilis* M. Pop. in Pochv. i bot. - geogr. issl. v bass. rr. Amu i Syr-Dar'i (Soil and Phytogeographical Studies in Amu-Dar'ya and Syr-Dar'ya River Valleys (I) 1915). 51.

Annual. Culms 10-20 cm tall; leaves linear, ca. 2 mm broad, blades and sheaths pilose. Panicle to 5 cm long, contracted, few-flowered, sub-unilateral; branches straight, scabrous, shorter than the spikelets;

spikelets lanceolate, 5-8-flowered, pubescent, ca. 1.5 cm long; lower glume linear-lanceolate, very acute, ca. 4 mm long, upper glume lanceolate, acute, slightly longer; lemmas linear-lanceolate, ca. 10 mm long, awned from below the sharply and deeply (1/3 of the length) bifid apex; awn strongly divergent, nearly as long as the lemma; palea shorter than the lemma; anthers 0.5-0.6 mm long.

Rocks, stony slopes. - Centr. Asia: Tyan'-Shan (Mongol-tau). Endemic. Described from the site indicated. Type in Tashkent and Leningrad.

41. *B. scoparius* L. Amoen. acad. IV (1759) 266. - *B. ovatus* Gaertn. in Nov. Comm. Acad. Petrop. XIV (1770) 537. - *B. confertus* M. B. Fl. taur.-cauc. I (1808) 71.

Annual or biennial. Culms 10-30 cm tall; leaves linear, 3-5 mm broad, blades and sheaths pilose. Panicle ca. 5 cm long, erect, contracted, ovoid or oblong; branches very short (shorter than the spikelets), bearing 1-3 spikelets; spikelets lanceolate, glabrous or, more often, pubescent, 6-12-flowered, 1.5-2 cm long; lower glume lanceolate, acute, ca. 5 mm long, the upper slightly longer; lemmas linear-lanceolate, 7-9 mm long, awned from below the sharply bifid apex; awn spreading (horizontally in maturity), about as long as the lemma; palea slightly shorter than the lemma; anthers 0.5 mm long. April-June.

Dry slopes, sandy places; also as a weed. - European part: Low. Volg. (Astrakhan), Crimea; Caucasus: all regions; Centr. Asia: all regions. Gen. Distr.: Medit., Balk. - Asia Min., Iran. Described from Spain. Type in London.

Series 6. *Ambiguæ* V. Krecz. et Vved. - Inflorescence spreading, with long, more or less divided branches. Lemmas oblong-elliptical, 12-15 mm long, with slightly divergent awn. Anthers 1 mm long.

42. *B. oxyodon* Schrenk in Bull. scient. Acad. Pétersb. X (1842) 355. - *B. nototropus* Rupr. in Mém. Acad. Pétersb., 7 sér., XIV, 4 (1869) 73, in adn. - *B. Krausei* Rgl. in A. H. P. VII (1881) 600.

Annual. Culms 30-90 cm tall; leaves linear, 2-10 cm broad, blades and sheaths pilose. Panicle to 25 cm long, loose, open, with scabrous, very long, flexed branches, bearing 1-4 spikelets each; spikelets lanceolate, 6-10-flowered, rather pubescent, (1) 2.5-3 cm long; lower glume linear-lanceolate, very acute, ca. 9 mm long, upper glume lanceolate, acute, slightly longer than the lower; lemmas oblong-elliptical, angular at the margin, 12-15 mm long, awned from below the very sharply bifid apex; awn divergent, slightly longer than the lemma; palea 2/3 as long as the lemma; anthers ca. 1 mm long. April-June. (Plate XLII, Figure 11).

582 Foothills and lower mountain zone. - Centr. Asia: Tyan'-Shan, Dzung. - Tarb., Pam. - Al. Gen. Distr.: Western Mongolia. Described from Dzhungariya. Type in Leningrad.

Series 7. *Macrostachyæ* V. Krecz. et Vved. - Inflorescence contracted; branches straight, shorter than the spikelets; lemmas broadly elliptical, prominently nerved; awns ascending. Anthers 1-2 mm long.

43. *B. macrostachys* Desf. Fl. Atl. I (1798) 96, tab. 19, fig. 2. - *B. pseudodanthoniae* Drob. in Fedde, Repert. sp. nov. XXI (1925) 39. - Exs.: Kneuck. No 166.

Annual. Culms 30-50 cm tall; leaves linear, 3-5 mm broad, blades and sheaths pilose. Panicle to 15 cm long, compact, few-flowered;

branches scabrous, shorter than the spikelets; spikelets lanceolate, subterete, glabrous or pubescent, 6-16-flowered, (1) 2-3 (5) cm long; lower glume lanceolate, acute, ca. 8 mm long, the upper oblong-lanceolate, acute, slightly longer; lemmas oblong-lanceolate, slightly angular at the margin, 12-15 mm long, awned from below the sharply and deeply bifid apex; awn spreading (finally subhorizontally), scarcely longer than the lemma; the topmost (sterile) florets of the spikelet often 3-awned (the lateral awns weak); palea much shorter than the lemma; anthers ca. 1 mm long. May-July.

Desert and foothill zones. -Caucasus: Dag., Tal.; Centr. Asia: Syr-Dar., Tyan'-Shan, Kara-Kum., Upp. Turkm., Pam.-Al. Gen. Distr.: Medit., Near Asia. Described from North Africa. (Tlemsen). Type in Florence.

ECONOMIC IMPORTANCE. Grass of good forage quality, but rare.

44. *B. Danthoniae* Trin. in C. A. Mey. Ind. cauc. (1831) 24.

Annual. Culms 20-35 cm tall; leaves linear, 2-4 mm broad, blades and sheaths glabrescent. Panicle to 10 cm long, erect, contracted, few-flowered, (often containing fewer than 5 spikelets); branches scabrous, much shorter than the spikelets, sometimes spikelets (the uppermost) sessile; spikelets oblong-lanceolate, compressed, 6-16-flowered, glabrous or pubescent, (1.5) 2-4 cm long; lower glume lanceolate, acute, 7-10 mm long, the upper slightly longer; lemmas oblong-elliptical, angular at the margin, 11-15 mm long, 3-awned from below the sharply bifid apex (the lowest florets in the spikelets 1-awned), the central awn longest, slightly longer than the lemma, finally horizontally spreading; the awns usually purple; palea much shorter than the lemma; anthers ca. 1.8-2 mm long. (Plate XLII, Figure 5 a).

583 A weed of dry stony slopes in the submontane zone. -Caucasus: South. and East, Transcauc., Tal.; Centr. Asia: all regions. Gen. Distr.: Balk. - Asia Min., Iran. Described from Talysh. Type in Leningrad.

ECONOMIC IMPORTANCE. Eaten readily in spring by all kinds of livestock. Produces good hay, when cut prior to flowering.

Genus 189. CERATOCHLOA* P. B.

P. B. Agrost. (1812) 75.

Inflorescence a rather open panicle. Spikelets lanceolate, laterally compressed, many-flowered, perfect. Glumes subequal, shorter than the lemmas and paleas. Lemmas keeled on the back, acuminate, awnless, terminating in an awn-point, or awned. Palea with 2 ciliolate or very scabrous keels. Stamens 3. Pistils usually 3, more rarely 2, with plumose stigmas. Caryopsis with 3 little hords at the top, furrowed.

1. *C. unioloides* (Willd.) P. B. Agrost. (1812) 75, tab. XV, fig. 7. -*Festuca unioloides* Willd. Hort. Berol. I (1806) 3. -*Bromus unioloides* Humb. et Kunth, Nov. Gen. I (1815) 151. -*Ceratochloa festucoides* P. B. Agrost. (1812) 158.

* From Greek *keros* - horn, and *chlos* - grass.

Perennial, or annual. Forming small tufts; culms 30-60 cm tall, suberect; leaves linear, to 7 mm broad, long-acuminate, flat, rather scabrous, puberulent on the veins; sheaths of the lower leaves retrorsely soft-pubescent; ligule oblong, to 6 mm long. Inflorescence to 25 cm long, contracted after anthesis, sometimes nodding, the branches long, scabrous, few-flowered; spikelets lanceolate, 1.5-3.0 cm long, 3-10-flowered, whitish-green; glumes somewhat unequal, 10-19 mm long, acuminate; lemmas 15-22 mm long, ovate-lanceolate, acuminate, sometimes awn-pointed; palea much shorter than the lemma. August.

Occasionally occurring in the U.S.S.R. in experimental cultivation. — European part: Upp. Don. (former Orlovskaya Guberniya, Polka Station) and Black Sea Region. Gen. Distr.: Here and there in cultivations in Centr. Eur., Atl. Eur., West. Medit., America. Described from Caroline. Type in Berlin.

ECONOMIC IMPORTANCE. A good forage plant.

Genus 190. BOISSIERA* HOCHST.

Hochst. ex Steud. in Flora XXI (1838) 1. Intell. 25, nomen; Steud. Syn. 1 (1855) 200 descr.

Panicle many-flowered. Spikelets subterete, many-flowered, 2-3 lower florets perfect, the upper ones reduced. Glumes unequal, many-keeled. Lemmas serrate at the apex, with 5-9 awns attached on the upper part of the back. Palea nearly as long as the lemma, 2-keeled. Lodicules 2, lanceolate, hyaline. Stamens 3, Stigmas short-plumose. Caryopsis not adnate to lemma and palea.

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* Named for E. Boissier, renowned botanist, investigator of oriental flora.

Explanation to Plate XLIV

1. *Lolium temulentum* L.: a) spike; b) lemma. — 2. *L. arvense* With.: a) spike; b) lemma. — 3. *L. cuneatum* Nevski: a) spike; b) lemma. — 4. *L. remotum* Schrank: a) spike; b) lemma. — 5. *L. persicum* Boiss. et Hoch.: a) spike; b) lemma. — 6. *L. rigidum* Gaud.: a) spike; b) lemma; c) palea; d) glume. — 7. *L. loliaceum* (Bory et Chaub.) Hand.-Mitt.: a) spike; b) lemma; c) glume. — 8. *L. multiflorum* Lam.: a) spike; b) lemma. — 9. *L. perenne* L.: a) spike; b) lemma; c) caryopsis. — 10. *Nardus stricta* L.: a) top of spike; b) detached floret. — 11. *Pholurus aristatus* (L.) Dur. -Jouv.: a) top of spike; c) a 2-flowered spikelet. — 12. *Pholurus incurvus* (L.) Schinz et Thellung: a) part of spike; b) a 1-flowered spikelet with glumes removed; c) stamens and ovary. — 13. *Pholurus pannonicus* (Hort) Trin.: a) part of spike; b) a 2-flowered spikelet with glumes removed. — 14. *Pholurus persicus* (Boiss.) A. Camus: a) part of spike. — 15. *Brachypodium silvaticum* (Huds.) Roem. et Schult.: a) lower glume; b) upper glume; c) lemma; d) portion of a spike, with spikelet borne on a very short pedicel; e) caryopsis. — 16. *B. pinnatum* (L.) P. R.: a) and b) lower and upper glume; c) lemma; d) portion of a spike, with spikelet borne on a short pedicel; e) terminal spikelet of the spike. — 17. *B. rupestre* Hort.: a) and b) lower and upper glume; c) lemma; d) portion of a spike with one spikelet. — 18. *Trachynia distachya* (L.) Link.: a) palea; b) lemma; c) inflorescence. — 19. *Anthosachne longiaristata* (Boiss.) Nevski: a) and b) lower and upper glume; c) lemma; d) palea; e) spikelet. — 20. *A. Jacquemontii* (Hook. f.) Nevski: a) lemma; b) palea.



1. *B. pumilio* (Trin.) Hack. in Denkschr. Acad. Wien, I (1885) 9. - *Pappophorum pumilio* Trin. Act. Petrop. (1830) 92. - *Boissiera bromoides* Hochst. in Steud. Nomenkl. 2 (1841) 213. - Exs.: Kotschy, P. Pers. austr. (1845) No 278a, et 313 (sub *B. bromoides*). - Ic.: Jaub. et Spach, Ill. pl. or. II (1844-46) tab. 197.

Annual. Forming small tufts; culms 10-30 cm tall, more or less ascending, puberulent; leaves linear-acuminate, flat, blades and sheaths puberulent; ligule short, obtuse. Panicle to 10 cm long, dense, ovoid-oblong; spikelets to 3 cm long, green or somewhat reddish, 5-10-flowered; glumes unequal, the lower shorter than the upper; lemmas 11-13-nerved, hyaline at the summit, 6-9-awned, pilose, more rarely glabrous (var. *glabriflora* Boiss.), the awn as long as its lemma, very scabrous. April-July. (Plate XLII, Figure 1, a, b).

Steppes, foothills. - Caucasus: South. Transcauc.; Centr. Asia: Karakum, Upp. Turkm., Amu-Dar., Syr-Dar., Pam. - Al. Gen. Distr.: East. Medit., Arm. - Kurd., Iran. Described from Persia. Type in Leningrad.

TRIBE XII NARDEAE RCHB.*

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Rchb., Consp. (1828) 55.

Inflorescence a straight spike. Spikelets 1-flowered, glumes lacking. Lodicules none. Stamens 3. Pistil 1, short, with a long stigma. Starch grains compound.

Genus 191. *NARDUS*** L.

L. Gen. pl. (ed. I. 19) ed. 5 (1754) 57.

Spike slender, 1-sided. Spikelets sessile, arranged alternately on two sides of a 3-angled rachis. Glumes lacking. lemma keeled, linear-subulate, tapering to a very short awn. Caryopsis linear, 3-sided, free, glabrous. Perennial, tufted plants.

1. *N. stricta* L. Sp. pl. (1753) 53; Griseb. in Ldb. Fl. Ross. IV, 324; Shmal'g. Fl. II, 652; Kryl. Fl. Zap. Sib. (Fl. of western Siberia) II, 342. - Ic.: Fl. Dan. tab. 1022. - Exs.: HFR No 1543, 1795.

Perennial. Rhizome short-creeping; culms stiff, glabrous, without nodes, (10) 15-30 cm tall; each of the shoots crowded in the tuft bearing 2 basal, scale-like leaves; leaves grayish-green, setaceous, scabrous on the margin, aggregate in tufts at the base of the culm. Spikes 4-10 cm long; spikelets bluish- or purplish-green, narrowly linear, 0.5-0.7 cm long (excluding awn); lemma tapering into awn 2-4.5 mm long. June. (Plate XLIV, Figure 10, a, b).

* Compiled by S. A. Nevskii.

** From Greek *nardos* - the name of some aromatic plant from India.

Meadows on podzolic and peaty soils, forest margins. -Arctic: Arctic Eur.; European part: Kar.-Lap., Dv.-Pech., Lad.-Il'm., Upp. Dnep., Upp. Volg., Volg.-Kam., Volg.-Don., Mid. Dnep., Low. Don.; Caucasus: West., East, and South. Transcauc. Collected in East. Siberia, apparently introduced.: Duriya. Gen. Distr.: Artic, Scand., Atl. Eur., Centr. Eur., West. Medit., Balk.-As. Min., Arm.-Kurd., N. Am. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. Prior to heading readily eaten by livestock; later hardly eaten at all. Often infesting dry-valley pastures.

TRIBE XIII. LEPTUREAE HOLMB.*

Holmb., Bot. Not. (1926) 80.

Inflorescence a spike. Spikelets 1-2-flowered. Glumes 1 or 2, coriaceous. Lemma and palea thinly white-hyaline. Stamens 3. Starch grains compound.

588 Genus 192. PHOLIURUS** TRIN.

Trin. Fund. Agrost. (1820) 131.

Spikes cylindrical, straight or curved; spikelets solitary in excavations of the rachis. Glumes 2, coriaceous, approximate, many-nerved, longer than the florets. Lodicules entire, oblong. Pistil with 2 subsessile, plumose stigmas. Caryopsis oblong-linear, free. Annuals.

- | | |
|--|--|
| 1. Glumes and rachis appressed-pubescent | 4. <i>Ph. persicus</i> (Boiss.) A. Camus. |
| + Glumes and rachis glabrous | 2. |
| 2. Ligule to 4 mm long; spikelets 2-flowered | 1. <i>Ph. pannonicus</i> (Host) Trin. |
| + Ligule very short or obsolete, not exceeding 0.5 mm in length; spikelets 1-2-flowered | 3. |
| 3. Spikes arcuately curved; spikelets 1-flowered, with narrow glumes; leaves glabrous | 2. <i>Ph. incurvus</i> (L.) Schinz et Thell. |
| + Spikes straight, more rarely slightly curved; spikelets 1-2-flowered, with broader glumes; leaves puberulent | 3. <i>Ph. glabriglumis</i> Nevskii. |

1. *Ph. pannonicus* (Host) Trin. Fund. Agrost. (1820) 131. -*Rotboellia pannonica* Host, Gram. Austr. I (1801) tab. 24. -*Lepturus pannonicus* Kunth. Enum. I (1833) 462; Griseb. in Ldb. Fl. Ross. IV, 325; Shmal'g. Fl. II, 655.

Annual. Culms geniculate below, 6-35 cm tall, glabrous and smooth; sheaths smooth; leaves flat, green, scabrous, glabrous; ligule oblong, to

* Compiled by S. A. Nevskii.

** From Greek *pholis* - scale, and *ura* - tail.

4 mm long. Spikes straight (rarely slightly curved), (3) 5-13 cm long, cylindrical; rachis joints 0.4-0.7 cm long, glabrous; spikelets 2-flowered, green, glabrous, slightly longer than the joints of the rachis glumes spreading in anthesis; glumes 0.5-0.7(0.8) cm long, lanceolate, acuminate, 7-nerved, glabrous; lemma and palea thinly hyaline, ca. 0.5-0.55 cm long. May-June. (Plate XLIV, Figure 13, a, b).

Solonchak and moderately saline meadows. -European part: Prichern., Crimea, Volg.-Don. Low.-Volg., Low. Don.; Caucasus: Ciscauc., East. Transcauc.; West. Siberia: Upp. Tob.; Centr. Asia: Aral. Casp. Gen. Distr.: Centr. Eur., Balk.-As. Min. Described from Hungary. Type in Vienna.

2. *Ph. incurvus* (L.) Schinz et Thellung in Vierteljahrsschr. Nat. Ges. Zürich. (1921) 265. -*Aegilops incurva* L. Sp. pl. (1753) 1051. -*Ae. incurvata* L. Sp. Pl. ed. II (1763) 1490. -*Lepturus incurvatus* Trin. Fund. Agr. (1820) 123; Griseb. in Ldb. Fl. Ross. IV, 325, p. pte; 589 Shmal'g. Fl. II, 655. -*Monerma cylindrica* auct. fl. cauc., non Coës. et Dur. -Ic.: Host., Gram. Austr. I (1801) tab. 23. -Exs.: Herb. Fl. Cauc. No 113.

Annual. Culms ascending or erect, often decumbent, 4-25 cm tall; leaves scabrous on the upper surface, smooth underneath, glabrous; ligule very short, not exceeding 0.5 mm in length. Spikes arcuately curved (more rarely slightly curved -f. *longiflorus* Grossh.), cylindrical; spikelets 1-flowered, green, glabrous, slightly longer than the joints of the rachis; glumes linear-lanceolate, narrow, acuminate, 0.4-0.7 cm long, 3-7-nerved; lemma and palea thinly hyaline, lemma acuminate. May-June. (Plate XLIV, Figure 12, a-c).

Sandy banks and slopes. -European part: Crimea; Caucasus: Dag., East. Transcauc.; Centr. Asia: Pam.-Al. (Zeravshan). Gen. Distr.: Medit. West. and East., Balk.-As. Min. Described from the Orient. Type in London.

NOTE. Specimens of *Pholiurus incurvus*, with slightly curved spikes, have been recorded for the Caucasus as *Monerma cylindrica*. This fact was first established by A. A. Grossheim. It is possible that the single old record in the literature, referring to *Monerma cylindrica* in Crimea (Steven), is based on a similar misconception.

3. *Ph. glabriglumis* Nevski in Sched. Herb. Fl. As. Med. No 527, in clave (1934). -*Lepturus erectus* var. *glabratus* Westberg ex Roshev. Consp. Gram. Turkest. (1923) 81, nomen.

Annual. Culms geniculate at the base, 9-35 cm tall, glabrous below the spikes; sheaths of lower leaves scabrous; ligule very short; leaves flat, short-pubescent underneath, short-pilose on the upper surface, scabrous on the margin. Spikes straight or slightly curved, 5-10 (16) cm long, cylindrical, with glabrous rachis; spikelets green, 1-2-flowered, as long as the rachis joints or slightly longer; glumes lanceolate, subobtus, perfectly glabrous, 7-nerved, (0.7) 0.8 cm long. May-July.

Dry and gravelly slopes in the foothills. -Caucasus: South. Transcauc.; Centr. Asia: Tyan'-Shan., Syr-Dar., Pam.-Al. Described from the surroundings of Tengikhoram Station. (Pam.-Al.). Type in Leningrad.

4. *Ph. persicus* (Boiss.) A. Camus, Ann. de la Soc. Linn. de Lyon, 69 (1922) 90. -*Lepturus persicus* Boiss. Diagn. ser. I XIII (1853) 71. -*L. erectus* Szov. in herb. Ldb. -*L. incurvatus erectus*

Griseb. in Ldb. Fl. Ross. IV, 325. -L. hirtulus Rgl. in A.H.P. VII (1880) 576.

Annual. Culms erect, 10-40 cm tall, pubescent below the spikes; sheaths of lower leaves scabrous; leaves flat, densely pubescent hairs longer on the upper surface), scabrous on the margin; ligule very short, obsolete; spikes straight or slightly curved, 6-12 (15) cm long, cylindrical, with appressed-puberulent rachis; spikelets grayish-green, 1-flowered or 2-flowered, as long as the rachis joints or slightly longer; glumes lanceolate, subobtusate, densely appressed-pubescent, obscurely nerved, 0.7-1 (1.05) cm long. May-July. (Plate XLIV, Figure 14).

- 590 Dry gravelly and argillaceous slopes in the foothills; occasionally as a weed in unirrigated fields. -Caucasus: South. Transcauc.; Centr. Asia: Tyan'-Shan., Syr.-Dar., Pam.-Al., Upp. Turkm. Gen. Distr.: Arm. -Kurd., Iran. Described from southern Persia. Type in Geneva.

TRIBE XIV. HORDEAE BENTH.*

Journ. Linn. Soc. Bot. XIX (1881) 31, s. mml.; Triticeae Hayek Oesterr. Bot. Zeitschr. LXXIV n. 11-12 (1925) 253.

Inflorescence a compound spike or spike-like (spikelets sometimes borne on very short pedicels). Glumes 2 (rarely lacking). Stamens 3. Starch grains simple.

Key to Genera

1. Spikelets solitary at each node of the rachis 2.
- + Spikelets 2-4(6) at each node of the rachis 14.
2. Spikelets short-pedicelled, subterete, scarcely or slightly laterally compressed, many-flowered 3.
- + Spikelets sessile or subsessile, more or less laterally compressed, 2-12-flowered 4.
3. Spikelets 1-3(4-6), arranged in a short inflorescence, all except the terminal spikelet borne on short, rather stout pedicels. Annual plants 194. *Trachynia* Link.
- + Spikelets more numerous, arranged in a spike-like, long inflorescence; all, except the terminal spikelet, borne on short pedicels. Perennial plants 193. *Brachypodium* P.B.
4. Spikelets of two kinds, some fertile, with 2 lower perfect florets and upper florets reduced to a single scale, arranged in a cluster borne on a short pedicel; other spikelets sterile, all florets being sterile and each reduced to a single scale; lemma of fertile florets verrucose in lower part 203. *Heteranthelium* Hochst.
- + All spikelets alike or only the terminal spikelet sterile. Lemmas pilose, scabrous, or glabrous, but not verrucose 5.
5. Nerves of lemmas not connivent at the summit; glumes serrate or many-awned 6.

* Compiled by S. A. Nevskii.

- + Nerves of lemmas connivent at the summit; glumes entire (rarely serrate), awnless or 1-awned 7.
6. Glumes and lemmas keeled 202. *Triticum* L.
- + Glumes and lemmas keelless 201. *Aegilops* L.
- 591 7. Glumes subulate-linear, obscurely 1-nerved (almost nerveless), lateral, with a scabrous margin .. 207. *Aneurolepidium* Nevski.
- + Glumes lanceolate or subulate-lanceolate, many-nerved or keeled, usually with a smooth margin 8.
8. Glumes with 1 or 2 keels 9.
- + Glumes keelless, many-nerved 12.
9. Glumes 2-keeled, broadly canaliculate between the keels, long-awned, ciliate in tufts on the keels 199. *Haynaldia* Schur.
- + Glumes 1-keeled, acuminate or short-awned 10.
10. Spikelets 2-flowered; glumes lateral, narrowly lanceolate-subulate 200. *Secale* L.
- + Spikelets 2-10-flowered; glumes covering the backs of lemmas of the lower florets (not lateral), lanceolate or narrowly lanceolate 11.
11. Glumes finally with rather thickened, corneous margins, more or less connate at the base. Rachis brittle. Annuals 198. *Eremopyrum* Jaub. et Spach.
- + Glumes with scarious margins. Rachis firm. flexible. Perennials 197. *Agropyrum* Gaerth. Subgenus *Euagropyrum* Nevski.
12. Spikelets strongly laterally compressed, flat, with remote florets (rachilla joints 3-4 mm long); rachilla breaking up very readily. Awns of lower lemmas (3) 4-7 (8) cm long, divergent 195. *Anthosachne* Steud.
- + Spikelets slightly laterally compressed; the florets not remote (very rarely subremote); rachilla not very readily breaking up. Awns straight or divergent, not so long, or spikelets awnless 13.
13. Glumes rather scabrous, usually with broad internerves, devoid of a transverse ridge at the base and adnate to the rudimentary pedicel. Florets mostly fertile, falling singly at maturity, glumes persistent on the rachilla. Anthers 1.5-3.5 (4) mm (very rarely 5 mm) long, half or less than half as long as the palea. Caryopsis very slightly concave, subplane, on the inner side. Tufted plants, almost invariably without creeping rhizomes, growing in forests, coppices, forest and high-mountain meadows 196. *Roegneria* C. Koch.
- + Glumes smooth or nearly so, occasionally scaberrulous only on the mid-nerve at the summit, usually glabrous, more rarely ciliate, with rather approximate nerves, thickened at the base by a transverse ridge. Spikelets sometimes falling intact with glumes. Anthers (4) 4.5-7 mm long, much exceeding half the length of the palea. Caryopsis deeply furrowed on the inner side. Plants with long creeping rhizomes or tufted, but stoloniferous; growing on stony slopes, rather dry meadows, and saline places 197. *Agropyrum* Gaertn. Subgenus *Elytrigia* (Desv.) Nevski.
- 592 14. Spikelets 1-flowered, with a rudiment of a second floret, arranged in threes at the nodes of the rachis, the lateral spikelets of each set short-pedicel 15.
- + Spikelets 2-12-flowered or, if 1-flowered, then all sessile; arranged in 2's-4's (6's) 17.

15. Spike cylindrical, with firm continuous rachis terminating in a spikelet 211. *Cuviera* Koeler.
 + Rachis not spikelet-bearing at the top, usually very brittle. Spikes more or less laterally compressed 16.
16. Glumes capillary, extremely slender, very long (to 7.5 cm), divaricate 212. *Critesion* Rafin.
 + Glumes at the base, awned, much shorter including awns—to 2.5–3 cm in length, usually erect 213. *Hordeum* L.
17. Spikes with a strongly articulate rachis, short 209. *Psathyrostachys* Nevski.
 + Rachis of spikes continuous, flexible 18.
18. Spikelets 1-flowered, with a rudiment of a second floret, arranged in twos. Awns long, divergent, rather broadly flattened 210. *Taeniatherum* Nevski.
 + Spikelets 2-many-flowered, arranged in 2's–6's, awnless or awned. Awns not broadly flattened 19.
19. Lemmas long-awned (rarely short-awned); awns often rather divergent. Spikelets arranged in 2's (rarely in 3's at the base), sometimes solitary at the top. Meadow or forest plants, with green or grayish-green, flat leaves 20.
 + Lemma awnless or with a very short, straight awn. Spikelets in 2's–3's, rarely in 4's–6's. Plants with glaucous, stiff, thick-veined, subinvolute leaves, growing on stony slopes, in saline places, and in coastal or riverside sands 21.
20. Glumes subulate or nearly obsolete. Lodicules hairy at the top 205. *Asperella* Humb.
 + Glumes linear-lanceolate or lanceolate. Lodicules ciliate on the margin or glabrescent 204. *Clinelymus* Nevski.
- 593 21. Glumes setaceous, perfectly glabrous and smooth, lustrous. Lemma woolly (the hairs to 2 mm long), with a short, nearly smooth, caducous awn; rachilla very brittle 208. *Malacurus* Nevski.
 + Glumes lanceolate or subulate-linear, pilose or rather scabrous on the edge and on the back. Lemma awnless or with a short, scabrous, persistent awn. Rachilla not brittle or slightly so 23.
22. Glumes 3–5-nerved, lanceolate or narrowly lanceolate, covering the backs of lemmas of the lower florets (not lateral), membranaceous-margined, smooth or soft-hairy. Lemmas awnless 206. *Elymus* L.
 + Glumes almost nerveless or 1-nerved (rarely obscurely 3-nerved), subulate-linear, lateral, scabrous above on the back and on the margins. Lemmas short-awned 207. *Aneurolepidium* Nevski.

NOTE. The tribe *Hordeae* is presented here in the scope in which it is treated in the study by S. A. Nevskii "O sisteme tribi *Hordeae* Benth." ("About the Systematics of the Tribe *Hordeae* Benth.") (in *Acta Inst. Bot. Acad. Sc. USSR*, ser. I (1934), 9), and includes all grasses with an inflorescence forming a compound spike (more rarely spiciform, on account of the presence of rudimentary pedicels below the spikelets) and containing simple starch grains.

Inflorescence spiciform, not dense; spikelets solitary, borne on short pedicels. Spikelets 6-20-flowered, initially cylindrical, later somewhat laterally compressed, green, subdivergent; rachilla very brittle. Glumes unequal, with numerous, thin, equal nerves, herbaceous to coriaceous, convex on the back, keelless, shorter than the lower floret. Lemma also keelless, convex, 5-7-nerved, abruptly narrowed into a slender awn, more rarely awnless. Lodicules small, oblong, attenuate toward the end, hairy on the top or ciliate on the margins. Stigmas plumose, subsessile. Caryopsis oblong, rather flattened, with a short, hairy appendage on the top. Perennials.

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1. Rhizome short; plants tufted. Inflorescence nodding, weak, with a very slender rachis. Awn 0.6-1.2 cm long, somewhat shorter or longer than the lemmas (Sect. I *Leptorachis* Nevski) 1. *B. silvaticum* (Huds.) P. B.
- + Rhizomes creeping, covered with shining, stiff, short scales. Inflorescence nodding to erect. Awn 0.1-0.4 (0.6) cm long, 1/3 to 1/2 as long as the lemma, or lemma awnless. (Sect. II, *Eubrachypodium* Nevski) 2.
2. Lemmas densely villous, awnless. 4. *B. villosum* Drob.
- + Lemmas pilose or glabrous, with awn 0.1-0.4 (0.6) cm long 3.
3. Lemmas ciliate-pilose on the margin or over the whole surface; glumes pilose 2. *B. pinnatum* (L.) P. B.
- + Lemmas entirely glabrous; glumes glabrous 3. *B. rupestre* (Host) Roem. et Schult.

Section 1. *Leptorachis* Nevski. - Characters in the key.

1. *B. silvaticum* (Huds.) P. B. Agrost. (1812) 101; Roem. et Schult., Syst. II (1817) 74; Griseb. in Ldb. Fl. Ross., IV, 346; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 342. - *Festuca sylvatica* Huds. Fl. angl., ed. 1 (1762) 38, non Vill. - Ic.: Fl. Dan. tab. 164, 2762. Exs.: HFR No 542.

Perennial. Tufted; culms erect, with dense long hairs at the nodes, slender, 50-100 cm tall; sheaths retrorsely hairy; leaves dark green, thin, flat, 0.6-1.2 cm broad, very scabrous on both sides, with scattered, long hairs on the upper side, a tuft of hairs on the underside at the base of the blade; ligule serrate. Inflorescence spike-like, 7-15 cm long, with (3) 5-8 (10) spikelets borne on pedicels to 1 mm long; spikelets slender, 1.7-2.5 cm long (excluding awns), 6-11-flowered; glumes narrowly lanceolate, gradually tapering into an aristate point, scaberulous, often ciliate on the margin in upper part, 5-7-nerved; lemmas narrowly lanceolate, long-ciliate on the margin, glabrous or glabrescent on the back, 0.9-1 cm long, the awn slender, 0.6-1.2 cm long. July-August. (Plate XLIV, Figure 15, a-c).

Shady, predominantly coniferous forests. - European part: Lad. - P'm., Upp. Dnep., Mid. Dnep., Upp. Volg., Volg. - Kam., Volg. Don., Prichern.,

* From Greek brachis - short, and podion - leg.

Crimes, Low. Don., Zavalzh.; Caucasus: Ciscauc., Dag., West, and East. Transcauc., Tal.; West. Siberia: Alt.; East. Siberia: Ang.-Sayan.; Centr. Asia: Upp. Turkm., Pam.-Al., Tyan'-Shan., Dzung.-Tarb. Gen. Distr.; Scand., Atl. and Centr. Eur., West, and East. Medit., Balk.-As. Min., Arm.-Kurd., Iran, Ind.-Him., Tibet, Jap.-Chin. Described from England. Type in London.

Section 2. *Eubrachypodium* Nevski. -Characters in the key.

2. *B. pinnatum* (L.) P.B. Agrost. (1812) 155; Griseb. in Ldb. Fl. Ross. IV, 345; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 340. -*Bromus pinnatus* L. Sp. pl. (1753) 78. -lc.: Host, Gram. Austr. I (1801) tab. 22. -Exs.: HFR No 748.

- 595 Perennial. Rhizome creeping; culms 50-120 cm tall, hairy and scabrous at the nodes; leaves flat, light green, 0.5-1 cm broad, with long, rather sparse hairs on the upper surface, very scabrous and sometimes with scattered hairs on the margin and on the lower surface. Inflorescence erect or nodding, with flexuous rachis scabrous on the angles, 7-12 (16) cm long, with (5) 7-11 spikelets; spikelets borne on pedicels 1-1.5 mm long, 2-3.5 cm long, (6) 8-15-flowered, somewhat divergent, pilose; glumes lanceolate, acuminate, pilose on the upper part or over the whole surface, shorter than the lowest floret, unequal, the upper 7-nerved, 0.7-0.9 cm long, the lower 3-5-nerved, 1/4 to 1/3 shorter than the lower; lemmas lanceolate, ciliate-pilose on the margin or on the entire surface, 7-nerved, 0.9-1 cm long, abruptly narrowed into an awn 2-4 (5-6) mm long; palea slightly shorter than the lemma, broadly and shallowly emarginate, long-ciliate on the keels above. June-July. (Plate XLIV, Figure 16, a-e).

Coppices, deciduous and mixed forests. -European part: Kar.-Lap., Dv.-Pech., Lad.-Il'm., Upp. Volg., Volg.-Kam., Upp. Dnep., Mid. Dnep., Low. Don., Zavalzh.; Caucasus: Ciscauc., South. Transcauc., Dag.; West. Siberia: Upp. Tob., Irt., Ob., Alt.; East. Siberia: Ang.-Sayan, Daur.; Centr. Asia: Aral.-Casp., Dzung.-Tarb., Tyan'-Shan. Gen. Distr.: Scand., Atl. and Centr. Eur., Balk.-As. Min., Arm.-Kurd., Iran. Described from Europe. Type in London.

3. *B. rupestre* (Host) Roem. et Schult. Syst. II (1817) 736. -*Bromus rupestris* Host. Gram. austr. IV (1809) 10, tab. 17.

Perennial. Rhizome creeping, covered with short, grayish scales; culms, in bunches of several, forming small tufts, rather hairy at the lower nodes, 25-90 cm tall; leaves flat, green or somewhat glaucous-green, 0.3-0.6 cm broad, very scabrous on both surfaces, with sparse, scattered hairs or glabrous on the upper surface. Inflorescence nodding to erect, (4) 5-10 cm long, with 5-10 spikelets on pedicels 0.5-1 mm long; spikelets green, (1,7) 2-3 (4) cm long, 8-13 (20)-flowered, subdivergent, glabrous; glumes lanceolate, acuminate, unequal, the lower 0.5-0.8 cm long, 3-5-nerved, the upper 0.7-1.0 cm long, 7-nerved, glabrous; lemmas entirely glabrous, lanceolate, pale green, 5-7-nerved, 0.9-1.1 cm long, abruptly narrowed into an awn 1-3 mm long; palea slightly shorter than the lemma, slightly emarginate, ciliate on the keels in upper part. June. (Plate XLIV, Figure 17, a-d).

Forest-covered mountain slopes. -European part: Crimes, Volg.-Kam. (Southern Ural), Zavalzh. (Sergievsk.); Caucasus: Ciscauc., West. Transcauc. Gen. Distr.: Atl. and Centr. Eur., Balk.-As. Min., Mediterranean. Described from southern Europe. Type in Vienna.

NOTE. Apparently one of the form of this species has been erroneously recorded for Crimea as *Brachypodium ramosum* Roem. et Schult. (see Zelenetzky, Prodr. Fl. Taur. (1906) 424)

596 ECONOMIC IMPORTANCE. Eaten readily by all kinds of livestock, although not nearly so as *Agropyrum repens*.

4. *B. villosum* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XII (1914) 175, tab. 13.

Perennial. Rhizome creeping; culms glabrous, 40-50 cm tall; leaves narrowly linear, to 3 mm broad, with inrolled margins, hairy on the upper surface, glabrous and smooth underneath. Inflorescence 9-10 cm long, with a flexuous rachis and 9-10 spikelets; spikelets divergent, (4) 5-8-flowered, (1) 1.2-1.5 cm long, borne on short pedicels; glumes acuminate, lanceolate, somewhat unequal, 0.6-0.7 cm long, glabrous and smooth, 5-nerved; lemmas lanceolate, densely villous (hairs long, white), awnless, subobtusate, 0.7-0.8 cm long. June-July.

Edges of fields. -East. Siberia: Len.-Kol. Endemic. Collected only once: surroundings of Yakutsk, "Meginskii ulus, Tulaginskii nasleg". Type in Leningrad.

NOTE. It is questionable whether this species belongs to the genus *Brachypodium*. It is possibly a hybrid *Brachypodium pinnatum* × *Agropyrum repens*, although *Brachypodium pinnatum* is so far unknown in the Lena-Kolyma district.

Genus 194. TRACHYNIA* LINK.

Link, Hort. Bot. Berol. I (1827) 42.

Culms bearing 1-2 spikelets at the end, or inflorescence spiciform, with 3-4 (5-7) spikelets. Spikelets subsessile, borne on very short, thickish pedicels, 7-30-flowered, initially subterete, later laterally compressed, divergent-ascending, the rachilla brittle (especially near the tip). Glumes lanceolate, acuminate, prominently nerved. Lemmas awned, with thick nerves. Lodicules rather large, oblong, pointed, minutely ciliate on the margin above. Caryopsis oblong, furrowed on the inner side. Annual.

1. *T. distachya* (L.) Link, Hort. Bot. Berol. I (1827) 43; Griseb. in Ldb. Fl. Ross. IV, 346. -*Bromus distachyos* L. Moench, acad. IV (1759) 304. -*Brachypodium distachyon* Roem. et Schult. Syst. II (1817) 741. -*Id.*: Fedtschenko, Rast. Turk. (1915) 142; Rechb. Ic. Fl. Germ. I, tab. 14.

Annual. Culms 3-20 (35) cm tall, very short-pubescent at the nodes, rigid, smooth, geniculate at the base, smooth; leaves short, ciliate on the upper surface and even more so on the margins, 1.5-3 (4) mm broad, flat, green. Spikelets (1.1) 1.4-2.2 (4-5.5) cm long (excluding awns), 7-12 (30)-flowered; glumes lanceolate, tapering to a short point, (3) 5-7-nerved, to 0.7 cm long; lemmas lanceolate, with 7 thick nerves, ciliate above on the margin, 0.7-0.8 cm long, almost imperceptibly scaberrulous, the awn

* From Greek *trachis* - to roughen.

slender, straight, 1-1.2 cm long; palea nearly as long as the lemma, obtuse, hispid on the keels near the summit. May-June. (Plate XLIV, Figure 18, a-c).

Dry stony slopes. -European part: Crimea; Caucasus: Ciscauc., East. and South. Transcauc.; Centr. Asia: Upp. Turkm., Pam. - Al. Gen. Distr.: West. and East. Medit., Balk. -As. Min., Arm.-Kurd., Iran. Described from southern Europe. Type in London.

NOTE. The following characters should be mentioned as representing generic differences in comparison with *Brachypodium*: 1) very short pedicels, as already pointed out by Link, who wrote in his description of *Brachypodium* (Hort. Bot. Berol. I (1827) p. 38): "Spiculae multiflorae, pedicello brevi", as against the description of *Trachynia* (l.c., p. 42): "Spiculae ultra decemflorae, pedicello brevissimo"; 2) structure of the inflorescence, with its small number of spikelets; 3) spikelets more compressed laterally (in *Brachypodium*); 4) unequal breakability of rachilla, which disarticulates readily between individual florets in upper part, whereas in the lower part it is almost continuous; 5) large, long-pointed and almost naked lodicules, and 6) annual habit.

Genus 195. ANTHOSACHNE* STEUD.

Steud. Syn. pl. glum. I (1855) 237.

Spikes erect or flexuous, enlarged at the top, owing to arrangement of awns. Spikelets 6-12-flowered, solitary, sessile or borne on short pedicels, flat, gradually enlarged toward the apex, cuneate attenuate toward the base, loosely flowered, with brittle rachilla, long-awned. Glumes linear-lanceolate, gradually tapering into a short awn or awn-point, unequal, smooth or nearly so, shorter than the lowest floret. Florets with an oval, naked or setiferous callus. Lemmas glabrous or scabrous, linear-lanceolate, lateral nerves faint, the thick mid-nerve excurrent into an awn; the awn long, tapering, dilated at the base, canaliculate, (3) 4-6 times as long as the lemma. Lodicules small, ciliate on the margin or glabrescent. Densely tufted perennials.

1. Lemmas entirely glabrous and smooth. Callus naked 1. *A. longiaristata* (Boiss.) Nevski.

- 598 + Lemmas in lower part with minute, appressed bristles. Callus more or less setiferous. 2. *A. Jacquemontii* (Hook. f.) Nevski.

1. *A. longiaristata* (Boiss.) Nevski, comb. nova. -*Brachypodium longiaristatum* Boiss. Diagn. ser. 1, VII (1846) 127. -*Agropyrum longiaristatum* Boiss. Fl. Or. V (1884) 660.

Perennial. A tufted plant, with glabrous, smooth culms, 30-65 cm tall; leaves setaceous-involute, very narrow, glabrous and scaberulous on the upper surface, smooth underneath, more rarely leaves pilose. Spikes panicle-like, rachis scabrous on the angles; spikelets pale green, 4-7 in

* From Greek *anthos* - flower, and *sachne* - scale.

number, very loosely 7-12-flowered (rachilla joints 3-4 mm long), 2.3-3.5 cm long (excluding awns); glumes linear-lanceolate, smooth, gradually tapering into a short awn, 3-5-nerved, unequal, 0.6-1.2 cm long; callus at the base of the floret oval; lemma linear-lanceolate, glabrous, 1-1.2 cm long, gradually produced into a tapering awn, enlarged at the base, (3.5) 4-8 cm long; palea linear, ciliate on upper 2/3 of the keels, 1-1.1 cm long. Anthers 4-6.5 (7) mm long. (Plate XLIV, Figure 19, a-e).

Gravelly high-mountain slopes. -Centr. Asia: Upp. Turkm. Gen. Distr.: Iran. Described from southern Persia. Type in Geneva, cotype in Leningrad.

2. *A. Jacquemontii* (Hook. f.) Nevski comb. nova. -*Agropyron Jacquemontii* Hook. f. Fl. of Brit. Ind. VII (1897) 369. -*Brachypodium tataricum* Munro ex Aitch. in Journ. Linn. Soc. (1880) 109, nomen. -*Agropyron canaliculatum* Nevski in Bull. Jard. Bot. Acad. Sc. URSS XXX (1932) 509. -*A. flexuosissimum* Nevski l.c., p. 510.

Perennial. A tufted, glaucous-green plant; culms 20-60 (9) cm tall, with numerous, subsetaceous-involute, narrow leaves; culm-leaves to 4.5 mm broad, very short-pubescent on the upper surface, smooth underneath. Spikes 7.5-17 cm long, rather flexuous, rachis scabrous on the angles; spikelets 3-13, glaucous-green, hoary or greenish-purple, (1.4) 1.6-2.3 (2.5) cm long (excluding awns), (5) 6-8-flowered; florets remote, with a setiferous callus. Glumes linear-lanceolate, tapering to a short awn or mucro, (3) 5-(7)-nerved, ca. (0.8) 0.9-1 cm long; lemmas linear-lanceolate or lanceolate, 1-1.2 cm long, roughened with minute, appressed bristles at the base or in lower half, gradually produced into the awn; awn divergent, dilated at the base, canaliculate, scabrous, (3) 4-6.5 cm long; palea linear-lanceolate, slightly shorter than the lemma, ciliate on the keels, subobtusate. July. (Plate XLIV, Figure 20, a, b).

Stony high-mountain slopes. -Centr. Asia: Pam.-Al. Gen. Distr.: Ind. -Him. Described from Kashmir. Type in London.

Spikes erect to nodding. Spikes (2) 3-7 (9)-flowered, slightly laterally compressed, subsessile, more or less awned; awns divaricate or straight, more rarely spikelets awnless. Glumes lanceolate to linear-lanceolate, usually with broad internerves, scabrous, more rarely scaberulous, devoid of a transverse ridge at the base, adnate to the rudimentary pedicel. Callus at the base of florets more or less hirsute. Lemmas scabrous or pilose, more rarely glabrous. Lodicules small, glabrescent or ciliate on the margin. Anthers 1.5-3.5 mm long, 1/3 or 1/2 shorter than the palea. Caryopsis oblong-linear, hairy at the top, subconvex to subplane on the adaxial side. Tufted, perennial plants, as a rule without creeping rhizomes (the only exception: *R. macroura* (Turcz.) Nevski). Leaves flat, rarely involute, slender, scabrous on both surfaces, glabrous or pilose.

ECONOMIC IMPORTANCE. Among the representatives of the genus *Roegneria*, only one is renowned as a forage plant, namely the so-called "American wheat grass" - *Roegneria trachycaulon* (Link) Nevski-*Triticum trachycaulon* Link. Hort. Berol. II (1833), 189. - *Agropyron tenerum* Vasey in Coult. Bot. Gaz. X (1885), 258. This plant was introduced into the U.S.S.R. from the U.S.A. in 1913 and, having fully proved itself as a good forage plant producing heavy yields of high-quality hay, it has spread considerably in cultivation in the forest-steppe and steppe regions of Western and Eastern Siberia, Central and Lower Povolzh'e, and the southern part of the Ukraine. It is of greatest importance as a field crop in pure stands and in mixture with alfalfa. It gives a uniform and close sward only in the first three years from sowing, and later becomes thin. The average yield in the U.S.S.R. is 26 centners per hectare, record annual production attaining 66 centners per hectare. Among the Soviet species of *Roegneria*, *R. fibrosa* (Schrenk) Nevski, which resembles *R. trachycaulon*, is distinguished by arched spikes and 3-nerved glumes. This grass ought to be studied, as it may prove to be equal to the American species in its forage value, and its importance would be greatly enhanced by the fact that it could be grown considerably more to the north.

- 600 1. Awns of the lemmas divaricate, long (Sect. I *Clinelymopsis* Nevski) 2.
 + Awns of the lemmas straight or slightly flexuous, but not divaricate or lemmas awnless (Sect. II *Cynopoa* Nevski) 13.
 2. Glumes small, much shorter than the lowest floret, 3-5-nerved . . 3.
 + Glumes large, as long as the lowest floret or slightly shorter, (3)5-7-nerved 7.
 3. Spikes very dense, 1-sided 4. *R. Schrenkiana* (Fisch. et Mey.) Nevski.
 + Spikes rather loose, weak, dropping or very strongly nodding, the spikelets rather remote 4.
 4. Low plants (25-65 cm tall), with short, subinvolute leaves, 0.15-0.3 cm broad 5.
 + Plants (50) 75-100 cm tall, with long, flat leaves, 0.3-0.9 cm broad . 6.
 5. Spikelets intensely purple-tinged. Leaves densely pubescent on both sides 3. *R. schugnanica* Nevski.
 + Spikelets pale green, often somewhat canescent. Leaves glabrous or slightly pilose on the upper surface 2. *R. czimganica* (Frob.) Nevski.
 6. Number of spikelets 10-20. Lemmas scabrous. 5. *R. confusa* (Roshev.) Nevski.
 + Number of spikelets (2) 4-5. Lemmas hairy 1. *R. caucasica* C. Koch.
 7. Glumes 3-5-nerved, linear-lanceolate, narrow, long-awned (awns 0.4-1 cm long); awns subdivaricate in maturity 6. *R. himalayana* Nevski.
 + Glumes 5-7-nerved, lanceolate or broadly lanceolate, more rarely linear, acuminate 8.
 8. Palea much shorter than the lemma (length of lemma considered to the base of awn), rounded-subobtuse. 9.
 + Palea as long as or only slightly shorter than the lemma, subobtuse 10.

9. Leaves pilose on both sides. Lemmas scabrous, hispidulous on the margin 7. *R. amurensis* (Drob.) Nevski.
- + Leaves glabrous. Lemmas long-ciliate on the margin 8. *R. ciliaris* (Trin.) Nevski.
10. Spikes rather intensely brownish-purple-tinged, dense, often 1-sided 11.
- + Spikes green or glaucous-green, bilateral, with somewhat remote spikelets 12.
11. Glumes linear-lanceolate or lanceolate, 0.7-1.1 cm long 9. *R. Turczaninovii* (Drob.) Nevski.
- + Glumes broadly lanceolate, 1.1-1.8 cm long 10. *R. curvata* Nevski.
12. Rachis smooth 11. *R. interrupta* Nevski.
- + Rachis rough with very numerous bristles 12. *R. Abolinii* (Drob.) Nevski f. *divaricans* Nevski.
13. Lemmas rather long-awned, the awn much longer than or as long as its lemma, rarely the awns of some florets in the spikelet shorter than the lowest lemmas 14.
- + Lemmas awnless or short-awned, the awn not exceeding half the length of its lemma (0.1-0.5 cm long) 27.
14. Glumes large, (1.1) 1.4-2 cm long, (5) 7-9-nerved, as long as or longer than the lowest floret 15.
- + Glumes smaller, 0.5-1 (1.2 cm long, 3-7-nerved), shorter than the lowest floret, rarely as long 18.
15. Glumes awned (awns 0.6-1 cm long) 15. *R. Drobovii* Nevski.
- + Glumes tapering into a short point, awnless 16.
16. Culms densely short-pubescent below the nodes, scabrous below the spikes 13. *R. macrochaeta* Nevski.
- + Culms glabrous and smooth 17.
17. Glumes 1.1-1.5 cm long. Leaves glabrous, scabrous on the upper surface 17. *R. sclerophylla* Nevski.
- + Glumes 1.5-2 cm long. Leaves usually with scattered white hairs on the upper surface 14. *R. panormitana* (Bert.) Nevski.
18. Spikes loose. The lower joints of rachis 1.2-3 cm long 19.
- + Spikes dense or fairly dense. Spikelets not remote 22.
19. Spikes drooping or strongly nodding. Lemmas ciliate on the margin, with awn 1.5-2.3 cm long 20.
- + Spikes erect or slightly nodding. Lemmas not ciliate on the margin, with awn 0.5-1.2 cm long 21.
20. Lemmas 0.8-1 cm long, sparsely covered with appressed bristles on the back in upper part. Spikelets 5-6-flowered, 1.3-2 cm long 23. *R. pendulina* Nevski.
- + Lemmas 0.7-0.75 cm long, glabrous on the back. Spikelets 4-5-flowered, 1-1.4 cm long 24. *R. brachypodioides* Nevski.
21. Spikelets pale green. Lemmas covered over the whole surface with fairly long hairs 39. *R. pubescens* (Trin.) Nevski.
- + Glumes more or less purple-tinged. Lemmas usually hairy only in lower part, rarely pubescent throughout its length 37. *R. jacutensis* (Drob.) Nevski.
22. Lemmas glabrous, smooth 25. *R. canina* (L.) Nevski.
- + Lemmas hairy or scabrous 23.

- 602 23. A densely pubescent plant. Sheaths, culms at the nodes, and leaves on both sides, soft-velutinous 18. *R. uralensis* Nevski.
 + A sparsely pubescent plant. Sheaths glabrous, only the lowest ones sometimes sparsely hairy. Leaves hairy on the upper surface, glabrous underneath, rarely with few scattered hairs also on the lower surface 24.
24. Glumes acuminate, awnless 19. *R. tianschanica* (Drob.) Nevski.
 + Glumes short-awned (awns 2-7 mm long) 25.
25. Leaf sheaths scabrous (the lowest ones sparsely hairy). Culms puberulent at the nodes 21. *R. viridiglumis* Nevski.
 + Leaf sheaths smooth (the lowest ones sparsely hairy). Culms glabrous 26.
26. Glumes broadly lanceolate, abruptly narrowed to a short awn. Spikes erect, more or less 1-sided 20. *R. Komarovi* Nevski.
 + Glumes linear-lanceolate or lanceolate, gradually narrowed to a short awn. Spikes slightly nodding or suberect, bilateral 22. *R. taigae* Nevski.
27. Rhizome creeping. Spikes loose, with very remote spikelets (the lower joints of rachis 2-4 cm long). Plants of riverside sands 40. *R. macroura* (Turcz.) Nevski.
 + Rhizome short. Tufted plants, never with creeping rhizomes. Spikes dense to fairly loose, but spikelets not remote 28.
28. Spikes arcuately curved. Glumes 3-nerved, much shorter than the lowest floret, acuminate. Lemmas awnless, subulate-pointed 36. *R. fibrosa* (Schrenk) Nevski.
 + Spikes erect or slightly nodding. Glumes 3-7-nerved. Lemmas very short-awned or awnless 29.
29. Rachilla glabrescent, with hardly perceptible, minute, appressed bristles. Glumes usually broadly lanceolate, asymmetrical at the top, abruptly narrowed to a short aristate point, purplish-hyaline or white-purplish-hyaline on the margin 30.
 + Rachilla hairy. Glumes different 32.
30. Lemmas roughened with minute, appressed bristles. 33. *R. sajanensis* Nevski.
 + Lemmas smooth, glabrous 31.
31. Glumes broadly lanceolate, (0.5) 0.6-0.9 (1) cm long. Leaves usually glabrous on the upper surface 55. *R. scandica* Nevski.
 + Glumes lanceolate, more rarely broadly lanceolate, smaller, (0.4) 0.5-0.7 (0.8) cm long. Leaves hairy on the upper surface. 34. *R. borealis* (Turcz.) Nevski.
- 603 32. Glumes half as long as the lowest floret, hyaline above and on the sides, obtuse or subobtuse. Arctic plants 39. *R. turuchanensis* (Reverdatto) Nevski.
 + Glumes as long as the lowest floret or slightly shorter, acuminate or erose-emarginate 33.
33. Glumes erose-emarginate 34.
 + Glumes more or less acuminate or terminating in a very short aristate point 35.
34. Lemmas sparsely covered with very short, appressed hairs 30. *R. Buschiana* (Roshev.) Nevski.

- + Lemmas glabrous or faintly scaberulous only near the apex, covered with a hoary bloom. 31. *R. troctolepis* Nevski.
- 35. Lemmas glabrous 36.
- + Lemmas scabrous or hairy. 37.
- 36. Spikes usually unilateral (spikelets secund), dense. Leaf sheaths strongly purple-tinged in lower part. Leaves flat, 5-8 mm broad 37. *R. kamczadalarum* Nevski.
- + Spikes bilateral, fairly loose, leaf sheaths purple-tinged. Leaves 3-4 mm broad, with rather inrolled margins 32. *E. leptoura* Nevski.
- 37. Glumes broadly lanceolate, (2) 2.5-4 mm broad, large, 11-16 mm long. Spikelets 5-9-flowered 38.
- + Glumes lanceolate or narrowly lanceolate, to 2.5 mm broad, smaller, 0.7-1.1 (1.3) cm long. Spikelets 3-5-flowered 39.
- 38. Rachis very rough owing to a dense covering of appressed bristles 12. *R. Abolinii* (Drob.) Nevski f. *breviaristata* Nevski.
- + Rachis glabrous, scabrous only on the two main angles. 16. *R. ugamica* (Drob.) Nevski.
- 39. Leaves hairy on the upper surface. 26. *R. angustiglumis* Nevski.
- + Leaves glabrous on the upper surface 40.
- 40. Lemmas pilose. Glumes lanceolate or broadly lanceolate 29. *R. transbaicalensis* Nevski.
- + Lemma scabrous. Glumes narrow, linear-lanceolate or lanceolate 28. *R. oschensis* (Roshev.) Nevski.

Section 1. *Clinelymopsis* Nevski. -Awns recurved, (1.5) 2-4 cm long.

Series 1. *Caucasicae* Nevski. -Spikes interrupted, with (2) 4-5 very remote, green spikelets. Glumes 1/4-1/3 as long as the lowest floret. Lemmas pilose. Leaves flat, thin.

- 604 1. *R. caucasica* C. Koch in *Linnaea* XXI (1848) 413. -*Triticum Roegneri* Griseb. in *Ldb. Fl. Ross.* IV (1853) 339. -*Agropyrum Roegneri* Boiss. *Fl. Or.* V (1884) 662; *Shmal'g. Fl.* II, 656.

Perennial. A loosely tufted, sciophilous plant; culms slender, smooth, glabrous or puberulent at the lower nodes, 75-100 cm tall; nodes short, not exceeding 1 mm in length; leaves green or glaucous-green, delicate, thin, scabrous, entirely glabrous or sparsely hairy on the upper surface, long, 0.3-0.7 cm broad. Spikes weak, nodding, 9-11 cm long, with (2) 4-5 very remote spikelets (rachis internodes 2-2.4 cm long); spikelets green, loosely 5-flowered, 2-2.4 cm long (excluding awns); glumes very small, the lower 0.2-0.4 cm, the upper 0.4-0.5 cm long, 2/9-1/3 the length of lowest floret, 5-nerved, oblong-lanceolate, acuminate, but without an awn-point; callus pilose on the sides; lemmas pilose, 1-1.2 cm long, prolonged into a divaricate awn 2.4-3.2 cm long; pales linear-lanceolate, slightly shorter than the lemma, bidentate at the summit, ciliate on the keels; anthers 3-3.5 mm long. June.

Forests. -Caucasus: Dag., East. Transcauc. Talysh. Endemic. Described from Dagestan. Type in Berlin.

Series 2. *Nanae* Nevski. -Spikes few-flowered, loose, the rachis often flexuous. Spikelets glaucous-green or somewhat tinged with purple. Glumes

3-8 mm long, $1/4-1/2$ the length of lowest floret. Lemmas scabrous. Leaves narrow, subinvolute.

2. *R. czimganica* (Drob.) Nevski comb. nova. -*Agropyron czimganicum* Drob. in Fedde, Repert. sp. nov. XXI (1925) 40. -*A. Schrenkianum* var. *alaicum* Drob. in Trav. Mus. Bot. Ac. Sc. Petrog. XVI (1916) 136.

Perennial. Low plants, 25-65 cm in height, slightly bent at the lower nodes, glabrous, smooth; leaves glaucous-green, 0.15-0.3 cm broad, subinvolute, glabrous or slightly hairy on the upper surface. Spike flexuous, weak, few-flowered, 7-9 cm long; spikelets (2) 3-6 (8), pale, glaucous-green, rarely very slightly tinged with purple, 5-7-flowered; distance between individual spikelets 1-1.2 cm; glumes small, $1/4-1/2$ the length of lowest floret, 0.4-0.8 cm long, (3)-5-nerved, linear-lanceolate, acuminate, occasionally with a short awn-point, scabrous on the nerves; lemmas lanceolate, 0.9-1 cm long, scabrous, prolonged into awn 2-3 cm long; callus short-setose on the sides; palea nearly as long as the lemma, very slightly emarginate or subobtusate; anthers 0.2-0.25 cm long. June-July. (Plate XLVI, Figure 3).

High-mountain meadows. -Centr. Asia: Dzong. -Tarb., Tyan'-Shan., Pam. -Al. Gen. Distr.: Dzong. -Kashg. Described from the mountains near Tashkent. Type in Tashkent.

3. *R. schugnanica* Nevski comb. nova. -*Agropyron schugnanicum* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 512, fig. 4.

605 Perennial. Densely tufted; culms subgeniculate at the base, glabrous, 30-60 cm tall; leaves short, narrowly linear, to 2 mm broad, glaucous, involute, densely short-pubescent on both sides. Spike flexuous, nodding, 5-10 cm long, with 4-9 (14) spikelets; rachis joints 0.7-1.3 cm long, scabrous on the two main angles; spikelets 5-7-nerved, intensely purple-tinged or greenish-purple; glumes 0.3-0.5 (0.6) cm long, purple, $1/4-1/2$ the length of lowest floret, linear-lanceolate, 3-5-nerved, acuminate; lemmas covered with minute appressed bristles, more profusely on the lower part, linear-lanceolate, 0.8-0.9 cm long. Awns divaricate, to 3 cm long; anthers 2.2 mm long. July (Plate XLVI, Figure 1, a, b).

High-mountain meadows. -Centr. Asia: Pam. -Al. Endemic. Described from the surroundings of Dzhilanda-Duzak-dar (Shungan). Type in Leningrad.

Series 3. *Confusae* Nevski. -Spikes containing numerous spikelets, dense to fairly loose. Spikelets greenish-purple. Glumes small, 3-8 mm long, shorter than the lowest floret, linear-lanceolate. Lemmas scabrous. Leaves flat, to 0.9 cm broad.

4. *R. Schrenkiana* (Fisch. et Mey.) Nevski comb. nova. -*Triticum Schrenkianum* Fisch. et Mey. in Bull. phys. math. de l'Acad. de Sc. Pétersb. III (1845) 305. -*Agropyron Schrenkianum* Drob. in Trav. Mus. Bot. Ac. Sc. Petrog. XVI (1916) 136.

Perennial. Culms fairly stout, 30-90 cm tall; sheaths of lower leaves covered with minute, retrorse hairs; leaves flat, 0.3-0.6 cm broad, scabrous, sometimes hairy. Spikes 1-sided, very dense, nodding, 5-11 cm long; rachis joints 0.3-0.8 cm long; spikelets greenish-purple, secund, borne on very short pedicels, 3-4-(5)-flowered; glumes linear-lanceolate, unequal, the lower 0.4-0.45 cm long, with awn 2-3.5 mm long, the upper 0.45-0.55 cm long, with awn to 5 mm long, 3-nerved; lemmas very scabrous

lanceolate, 0.4-1.1 cm long, awn recurved, 1.5-2 times as long as its lemma (1.5-2.2 cm long); anthers 1.5-1.8 mm long. July.

Mountain meadows. -Centr. Asia: Dzung.-Tarb., Tyan'-Shan., Pam. -Al. Gen. Distr.: Dzung.-Kashg. Described from Tarbagatai. Type in Leningrad.

NOTE. Differs from the outwardly similar *Clinelymus nutans* (Griseb.) Nevski in the solitary spikelets and larger glumes.

5. *R. confusa* (Roshev.) Nevski comb. nova. -*Agropyrum confusum* Roshev. in Not. Syst. ex Herb. Horti Bot. Reip. Ross. V (1924) 150.

Perennial. A densely tufted plant, 50-100 cm tall; leaf sheaths shorter than the internodes, glabrous, smooth; leaves to 0.9 cm broad, flat or slightly inrolled at the margins, green. Spikes drooping, loose, 10-20 cm long, rachis scabrous on the angles; rachis joints 0.7-1.5 cm long; spikelets 10-20, 3-5-flowered, greenish-purple, rather intensely purple-tinged; glumes linear-lanceolate, 0.3-0.8 cm long, acuminate or short-awned, 3-nerved; lemmas narrowly lanceolate, scabrous, 0.9-1.1 cm long, the awn divaricate, 2-2.5 cm long; palea linear-lanceolate, subobtuse or weakly emarginate; anthers 2.5 mm long. June-July.

Meadows in river valleys. -East. Siberia: Aug. -Sayan., Daur., Len. -Kol.; Far East: Ze.-Bur., Ud., Okhot., Kamch. Gen. Distr.: Mong. Described from Siberia. Type in Leningrad.

Series 4. *Himalayanae* Nevski. -Spikes drooping, containing numerous spikelets. Spikelets greenish-purple. Glumes nearly as long as the lowest floret, linear-lanceolate, long-awned, the awns finally more or less divergent. Lemmas scabrous. Leaves flat.

6. *R. himalayana* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, 2, (1934).

Perennial. Culms 70-75 cm tall, smooth, glabrous; leaves flat, to 4 mm broad, or subinvolute, green, scabrous and sparsely hairy on the upper surface, scabrous and smooth underneath. Spike weak, 10-15 cm long, rachis scaberulous, its lower joints 1.2-2 cm long; spikelets purple or greenish-purple, subsessile, 4-5-flowered, subdivergent, 1.8-2 cm long (excluding awns); glumes linear-lanceolate, gradually acuminate, unequal, long-awned, the upper 0.8-1.2 cm long (excluding awn), 3-5-nerved, with awn 0.8-1 cm long, the lower 0.7-0.8 cm long, with awn 0.4-0.7 cm long, 3-nerved, both glumes narrow, scabrous, divergent (especially in maturity), appearing slightly recurved; lemmas lanceolate, very scabrous, 1-1.2 cm long, prolonged into a scabrous, recurved divaricate awn 2.2-3 cm long; palea linear-lanceolate, nearly as long as the lemma, ciliate on the keels. June-July. (Plate XLVI, Figure 2, a-c).

High-mountain meadows. -Centr. Asia: Pam. -Al. Collected in the U. S. S. R. only on a single occasion in the Alai Range. Gen. Distr.: Ind. -Him. Described from Kashmir. Type in Leningrad.

Series 5. *Ciliare*s Nevski. -Spikes erect or slightly nodding, bilateral. Spikelets green or glaucous-green. Glumes lanceolate, awnless, 6-10 mm long, shorter than the lowest floret. Lemmas pilose or rather scabrous, ciliate-margined. Palea much shorter than the lemma, rounded subobtuse.

7. *R. amurensis* (Drob.) Nevski comb. nova. -*Agropyron amurense* Drob. in Trav. Mus. Bot. Ac. Sc. Petrog. XII (1914) 50,

tab. 1, fig. 6. -*Triticum ciliare* Trin. f. *pilosum* Korsh. in A.H. P. XII (1892) 414.

Perennial. Culms rather thick, 80-100 cm tall, slightly geniculate at the base; leaf sheaths antrorsely hairy; leaves very hairy on both surfaces, 607 0.4-0.8 cm broad. Spikes 10-20 cm long, nodding or suberect, bilateral; spikelets green, 5-7-flowered; glumes lanceolate, acuminate, 5-7-nerved, rough on the nerves and in upper part on the margin, owing to minute, stiff bristles, nearly the length of the lowest floret, 0.7-1 cm long; lemmas 0.9-1 cm long, lanceolate, rough with minute appressed bristles, hispid on the margin, prolonged into a divaricate awn 2-2.5 cm long; palea much shorter than the lemma, 0.7 cm long, dilated toward the summit and rounded-subobtusely; anthers 2.5 mm long. June-July.

Dry slopes and rocks. -Far East: Ussur., Ze-Bur., Ud. Gen. Distr.: Manchuria. Described from the surroundings of the village Soyuznaya (on the Amur River). Type in Leningrad.

8. *R. ciliaris* (Trin.) Nevski comb. nova. -*Triticum ciliare* Trin. in Bunge, Enum. plant. in China bor. coll. (1836) 72. -*Agropyrum ciliare* Franchet, David, pl., 341. -*Id.*: Drob., Trav. Mus. Bot. Ac. Sc. Petrog. XII (1914) tab. 1, fig. 5.

Perennial. Plants 70-100 cm tall, forming rather loose tufts; leaves glabrous on both sides, scabrous, 0.4-0.9 cm broad. Spikes 2-sided, erect or nodding, (10) 14-22 cm long; spikelets glaucous-green, 7-9-flowered; glumes elliptical-lanceolate, abruptly attenuate, terminating in a very short aristate point, ciliate on the margin, (5)-7-nerved, 0.6-0.8 cm long, slightly shorter than the lowest floret; lemmas lanceolate, 0.8-1 cm long, pilose, long-ciliate on the margin, the awn divaricate, to 2.5 cm long; palea 0.6-0.7 cm long, much shorter than the lemma, rounded subobtusely at the apex; anthers 2 mm long. June. (Plate XLVI, Figure 4, a-c).

Far East: only in the south of Ussuri region, mostly in wet places (roadsides and fallows; introduced?). Gen. Distr.: Jap. -Chin. Described from Kan-Tay (China). Type in Leningrad.

Series 6. *Curvatae* Nevski. -Spikes erect or slightly bent, usually 1-sided, dense. Spikelets more or less purple-tinged. Glumes linear-lanceolate or broadly lanceolate, as long or slightly longer than the lowest floret, 7-18 mm long; lemmas scabrous. Palea very slightly shorter than the lemma, subobtusely.

9. *R. Turczaninovi* (Drob.) Nevski comb. nova. -*Agropyron Turczaninovi* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XII (1914) 47. -A. *Gmelinii* Kryl. Fl. Alt. (1914) 1695. -*Id.*: Ldb. *Id.* Fl. Ross. III, tab. 248 sub nom. *Tr. caninum* var. *Gmelinii*.

Perennial. A loosely tufted plant, 60-100 cm tall; culms slightly geniculate at the base, glabrous; sheaths of the lower leaves sometimes retrorsely hairy; leaves 0.4-0.9 cm broad, scabrous, loosely pilose on the upper surface, more rarely glabrous on both surfaces. Spike erect, usually distinctly 1-sided (spikelets secund), 7-15 cm long, rachis rough 608 on the angles with stiff bristles; spikelets purplish-brown or almost blackish-purple, sometimes canescent, the spikelets glaucous-green only on shaded plants; spikelets 4-5-flowered; glumes linear-lanceolate, gradually long-acuminate, 5-7-nerved, very scabrous, 0.7-1.1 cm long, 0.2-0.3 cm broad, the upper glume slightly longer; lemmas lanceolate, 0.9-1.1 cm

long, scabrous, the awn 2.5-4 cm long, divaricate (especially in maturity); palea as long as the lemma or nearly so, subobtusate, hispid on the keels; anthers 2.5 mm long. June-July.

Dry-river meadows, glades, mud flats. -West, Siberia: Alt.; East, Siberia: Ang.-Sayan., Daur., Len.-Kol.; Far East: Ze.-Bur., Ud., Sakh., Okhot. Kamch.; Centr. Asia: Dzung.-Tarb. Gen. Distr.: Mong., Dzung.-Kashg. Described from Dauria. Type in Leningrad.

ECONOMIC IMPORTANCE. Readily eaten, yields up to 20-30 centners per hectare of hay. Ought to be tested under cultivation.

10. *R. curvata* Nevski comb. nova. -*Agropyrum curvatum* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 629. -*Agropyron macrolepis* Drob. in Fedde, Repert. sp. nov. XXI (1925) 41, pro parte. -*A. semicostatum* Hack. (in herb.), non Nees.

Perennial. Culms robust, erect or slightly geniculate at the base, 50-100 cm tall; sheaths smooth, glabrous, more rarely the lower sheaths pilose; leaves flat, scabrous and glabrous (more rarely with scattered hairs) on the upper surface, smooth and lustrous or scabrous on the under-surface, 0.5-1.2 cm broad. Spikes dense, erect or slightly curved, often somewhat 1-sided, 7-16 cm long, broadened above due to the divaricate awns; spikelets sessile, subdivergent, greenish-tawny-purple, green only on shaded plants, 5-6-flowered; glumes broadly lanceolate, acuminate, pointed, sometimes terminating in a tooth, membranaceous on the margin at the summit, 1.1-1.8 cm long, 2.3-3.5 mm broad, 5-7-nerved, as long as or slightly longer than the lower floret; lemmas lanceolate, 1-1.4 cm long, appressed-setose (bristles very short), scabrous, 5-nerved, the mid-nerve thick, excurrent into an awn, the awn 3 times the length of the lemma, 2.5-3.7 cm long; palea lanceolate, subobtusate, 0.9-1.3 cm long, hispid on the keels; anthers 2.5-3 mm long. June-July. (Plate XLVII, Figure 5, a-c).

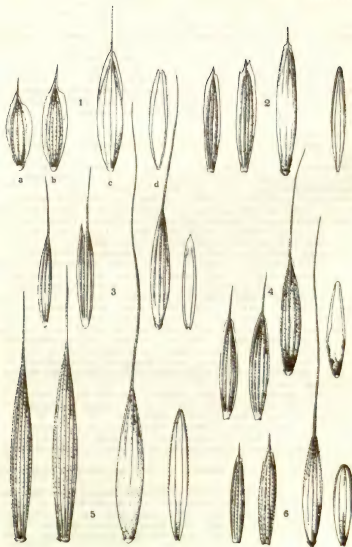
Mountain meadows. -Centr. Asia: Dzung.-Tarb., Tyan'-Shan., Pam.-Al. Gen. Distr.: Dzung.-Kashg. Described from the northern slopes of Ketmenskie Mountains (Kirgiz-sai Pass). Type in Leningrad.

Series 7. *Interruptae* Nevski. -Spikes erect, bilateral, fairly loose. Spikelets glaucous-green. Glumes equaling or slightly exceeding the length of lowest floret, 10-15 mm long, broadly lanceolate, nearly smooth. Lemmas scabrous. Palea very slightly shorter than the lemma.

11. *R. interrupta* Nevski comb. nova. -*Agropyrum interruptum* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 632. -*Agropyron macrolepis* Drob. in Fedde, Repert. sp. nov. XXI (1925) 41, pro parte.

Explanation to Plate XIV

1. *Roegneria scandiaca* Nevski. -2. *R. macrochaeta* (Turcz.) Nevski. -3. *R. uralensis* Nevski. -4. *R. Komarovii* Nevski. -5. *R. Drobovii* Nevski. -*R. pendulina* Nevski. -In all cases "a" and "b" - lower and upper glume; "c" - lemma, and "d" - palea.



Perennial. Culms 60-95 cm tall, glabrous or pubescent at the nodes; leaves to 0.4 cm broad, glaucous-green, subinvolute, pilose on the upper surface, thick-veined, puberulent or glabrous underneath. Spike erect, slender, to 17 cm long, bilateral, with rather remote spikelets (rachis joints 1-2 cm long, nearly smooth); spikelets glaucous-green, 5-7-flowered, appressed to the rachis; glumes 1-1.5 cm long, broadly lanceolate, sometimes 1-toothed and unequal-sided, terminating in a small awn-point, scarious-margined above, 7-nerved, the nerves scarious or smooth; callus with short bristle on the sides; lemmas lanceolate, 1-1.2 cm long, bidentate, rough owing to a copious covering of extremely short, appressed bristles, the midnerve prominent above the middle and excurrent into awn 2-2.5 cm long; palea nearly as long as the lemma, subobtusate; anthers 3.5 mm long. June-July.

Mountain meadows and slopes. -Centr. Asia: Pam.-Al. Endemic. Described from Dzhidzhikrut River, on the Yagnob (Tadzhikistan). Type in Leningrad.

Section II. *Cynopoa* Nevski. -Awn of lemmas straight or slightly flexuous, but not divaricate, or lemmas awnless (very rarely the awns slightly divergent: in *R. Abolinii* (Drob.) Nevski).

Series I. *Inaequisetae* Nevski. -Spikes erect or slightly nodding, bilateral, with a very scarious rachis. Glumes nearly as long as the lowest floret, often 1-toothed. Lemmas scarious, with awn 0.5-1 (2) cm long.

12. *R. Abolinii* (Drob.) Nevski comb. nova. - *Agropyron* *Abolinii* Drob. in Fedde, Repert. sp. nov. XXI (1925) 42.

Perennial. Culms erect, 80-115 cm tall; leaves flat, 0.4-0.7 cm broad, pilose on the nerves on the upper side or glabrous, scarious. Spikes 10-20 cm long, nodding or erect, rachis roughened with very numerous short bristles; spikelets fairly remote, 5-7-flowered, green or slightly tinged, rachilla appressed-pilose; glumes subequal, green, with a lustrous sheen, lanceolate, 1.1-1.6 cm long, 2-3 mm broad, 5-7-nerved, very scarious, acuminate, often unequal-sided and 1-toothed, scarious-margined; 612 lemmas lanceolate, 1-toothed at the apex, scarious-hairy, 0.9-1.3 cm long, prolonged into a scarious awn; awns very variable in length and degree of divergence, occasionally 1-2.2 cm long, subdivaricate (f. *divaricans* Nevski), more often 0.3-1 cm long, nearly straight (f. *breviaristata* Nevski); palea 0.8-1 cm long, shorter than the palea, subobtusate; anthers 3.5 mm long. June.

Meadows and slopes in valleys of mountain streams. -Centr. Asia: Tyan'-Shan., Dzung.-Tarb. Gen. Distr.: Dzung.-Kashg. Described from Alma-Atinskii Raion. Type in Tashkent.

Series 2. *Macrochaetae* Nevski. -Spikes rather loose, bilateral, erect or slightly nodding. Glumes narrowly lanceolate, 1.4-1.9 cm long, acuminate, entire, nearly as long as the lowest floret. Lemmas scarious, long-awned.

13. *R. macrochaeta* Nevski in Act. Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. Culms very firm, 100-135 cm tall, densely short-pubescent below the nodes, scarious below the spike; leaf sheaths scarious; leaves subplane, 4-8 mm broad, scarious underneath, densely pilose on the upper surface. Spikes 8.5-20 cm long, rather loose, the lower spikelets rather remote; rachis scarious on the angles; spikelets greenish-purple, more

rarely green, appressed, 3-5-flowered, 2-2.2 cm long (excluding awns); glumes ca. (2) 2.5-2.75 mm broad, slightly asymmetrical, (5) 7-9-nerved, very scabrous; lemmas lanceolate, 1.2-1.6 cm long, prolonged into a straight or subflexuous awn 2-3.5 cm long; palea shorter than the lemmas, 0.9-1.35 cm long, lanceolate, rounded-subobtusate at the apex. July-September.

Meadows and slopes in valleys of mountain streams. -Centr. Asia: Pam.-Al. Endemic. Described from eastern Tadzhikistan. Type in Leningrad.

Series 3. *Panormitanae* Nevski. -Spikes bilateral, erect. Glumes exceeding the length of lowest floret, 15-20 mm long, gradually acuminate, entire. Lemmas scabrous, long-awned.

14. *R. panormitana* (Bertol.) Nevski comb. nova. -*Triticum panormitanum* Bertol. Fl. Ital. IV (1839) 870. -Ic.: Boiss. Voy. Bot. I (1837) tab. 181.

Perennial. Rhizome short; culms 80-100 cm tall, erect, smooth; leaves slender, green, glabrescent on both sides, with scattered white hairs only on the upper surface, very scabrous, 0.5-1 cm broad. Spikes bilateral, slender, 10-20 cm long, rachis hispid on the main angles; spikelets green, appressed, 3-5-flowered, 3-4 cm long, awns included (1.5-2 cm long excluding awns); glumes linear-lanceolate or lanceolate, exceeding the lowest floret, 1.5-2 cm long, gradually long-acuminate to a small point, very scabrous, 7-9-nerved, somewhat unequal; lemmas lanceolate, nearly smooth, 1.2-1.5 cm long, prolonged into a straight awn 2-3.2 cm long; palea lanceolate, somewhat shorter than the lemma, slightly emarginate or subobtusate, ciliate on the keels; anthers 5 mm long. June.

Mountain forests. -European part: Crimea. Collected only once near Alushta. Gen. Distr.: West, Medit., Balk. -As. Min. Described from the neighborhood of Palermo.

Series 4. *Oplismenolepides* Nevski. -Spikes 1-sided, dense, erect. Glumes longer than the lowest floret, 10-17 mm long, gradually acuminate and awned, entire. Lemmas scabrous, long-awned.

15. *R. Drobovii* Nevski comb. nova. -*Agropyrum Drobovii* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 626. -*A. turkestanicum* Drob. in Fedde, Repert. sp. nov. XXI (1925) 42, non Gandoger in Bull. Soc. Bot. Fr. (1913) 420.

Perennial. Culms robust, erect, 1.5-2 m tall, smooth; leaves flat, glaucous-green, 0.8-1.4 cm broad, scabrous and glabrous on both sides. Spikes usually subunilateral (spikelets secund), erect, dense, 13-18 cm long; spikelets 5-7-flowered, green or greenish-purple, 3-4.5 cm long, including awna; glumes subequal, linear-lanceolate, oblong, 1-1.7 cm long, ca. 2.5 mm broad, gradually long-acuminate, awned (awns 0.6-1 cm long), very scabrous, 5-7-nerved, faintly purple at the base; lemmas lanceolate, 5-nerved, appressed-hirsute, 0.9-1.3 cm long, the awn very scabrous, twice the length of lemma, 2-2.7 cm long; palea lanceolate, emarginate, ciliate on the margin; anthers 3.5 mm long. June. (Plate XLV, Figure 5).

Sloping mountain meadows. -Centr. Asia: Tyan'-Shan., Pam.-Al. Endemic. Described from the mountains near Tashkent. Type in Tashkent.

Series 5. *Dentatae* Nevski. -Spikes dense, 1-sided, erect. Glumes very slightly shorter than the lowest floret, 11-15 mm long, broadly lanceolate (2.5-4 mm broad), asymmetrical, often 1-2-toothed near the apex, acuminate. Lemmas scabrous, short- or long-awned.

16. *R. ugamica* (Drob.) Nevski comb. nova. - *Agropyron ugamicum* Drob. in Fedde, Report. sp. nov. XXI (1925) 41. - *A. dentatum* auct., non Hook. f.

- Perennial. Culms geniculate at the base, robust, rather stout, 50-120 cm tall; sheaths smooth or the lower ones pilose; leaves flat, covered with scattered hairs, scabrous on the upper surface, smooth or scabrous underneath, 0.7-1.1 cm broad. Spikes 7-13 cm long, dense, erect, 1-sided (spikelets secund rather thick, rachis scabrous on the angles; spikelets 5-9-flowered, 2-3 cm long, narrow, subdivergent, greenish or tinged; 614 glumes large, 1.2-1.5 cm long, broadly lanceolate (2.5-4 mm broad), subequal, acuminate, often 1-toothed at the apex, hyaline-margined, prominently (5) 7-9-nerved, very scabrous; lemmas 1.1-1.3 cm long, lanceolate, short-awned, the stoutish awn 0.1-0.5 (0.7) cm long, hirsute, rough; palea nearly as long as the lemma, 1-1.2 cm long, rounded-obtuse, hispid on the keels; anthers 2.5-3 mm long. July.

Mountain meadows. - Centr. Asia: Dzung. - Tarb., Tyan'-Shan., Pam. - Al. Described from Ugam River valley. Type in Tashkent.

ECONOMIC IMPORTANCE. A valuable forage grass, producing a large amount of herbage.

17. *R. sclerophylla* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934). - *Agropyron tianschanicum* Drob. in Fedde, Report. sp. nov. XXI (1925) 42, pro parte.

Perennial. Culms rather stout, to 100-105 cm tall, smooth; leaf sheaths smooth; leaves glaucous-green, 0.5-0.8 cm broad, scabrous or nearly smooth underneath, scabrous, glabrous on the upper surface, stiff. Spikes dense or somewhat interrupted below, more or less 1-sided, 11-20 cm long, rachis scabrous on the angles; spikelets greenish-purple, 5-flowered, appressed; glumes broadly lanceolate, 1.1-1.5 cm long and (2.5) 3-3.5 (3.75) mm broad, acuminate, sometimes 1-toothed, 7-9-nerved, very scabrous; lemmas lanceolate, scabrous, covered with small appressed bristles, 5-nerved, 1-1.2 cm long, prolonged into a straight or slightly flexuous awn ca. 2 cm long; palea as long as the lemma, obtuse. July.

Mountain meadows and gravels. - Centr. Asia: Pam. - Al. Endemic. Described from the gravels of Ravnou River (Darvaz). Type in Leningrad.

Series 6. Subsecundae Nevski. - Spikes dense, more or less 1-sided, erect. Glumes slightly shorter than the lowest floret, lanceolate or broadly lanceolate, 8-10 (12) mm long, asymmetrical, sometimes 1-toothed, 5-7-nerved, acuminate or short-awned. Lemmas more or less hirsute, long-awned.

18. *R. uralensis* Nevski comb. nova. - *Agropyrum uralense* Nevski in Bull. Jard. Bot. Princ. URSS XXIX (1930) 89.

- Perennial. A very densely pubescent plant; culms pubescent below the nodes; sheaths densely pilose; leaves flat, with finally inrolled margins, velutinous on both sides, soft. Spikes dense, subunilateral, 8.5-17 cm long, rachis ciliate on the angles; spikelets 3-5-flowered, green or greenish-purple; glumes lanceolate, sometimes 1-toothed, 0.8-1 cm long, (3)-5-(7)-nerved, scabrous, awned (awns 3-7 mm long); lemmas 0.8-1.1 cm long, lanceolate, glabrescent, with small appressed bristles below, with 615 awn 0.8-1.8 cm long; palea 0.7-1 cm long, slightly emarginate or subacute; anthers 2.5 mm long. July. (Plate XLV, Figure 3).

Steppes and mud flats. -European part; Volg.-Kam. (southern Ural). Endemic. Described from the valley of Sakmara, near the village Nurgalinaya. Type in Leningrad.

19. *R. tianschanica* (Drob.) Nevski comb. nova. -*Agropyron tianschanicum* Drob. in Fedde, Repert. sp. nov. XXI (1925) 42; emend. Nevski in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 622. -*A. czilikense* Drob. in Fedde, Repert sp. nov. XXI (1925) 43.

Perennial. Culms erect, 50-100 cm tall, smooth; sheaths smooth; leaves flat, scabrous and pilose above, scabrous and sometimes scattered-pilose underneath. Spikes dense, with longer rachis joints in shaded specimens, sometimes more or less 1-sided, erect or slightly nodding, 7-17.5 cm long; glumes greenish-purple, 3-5 (7)-flowered; glumes 0.9-1.2 cm long broadly lanceolate, abruptly narrowed, mucronate, sometimes 1-toothed, 5-7-nerved, scabrous; lemmas lanceolate, pilose, 0.9-1.2 cm long, prolonged into a straight awn, the awn usually as long as the lemma, 0.7-1.6 cm in length; palea as long as the lemma or, more often, very slightly protruding above the base of the awn of the lemma, lanceolate, subobtuse or subemarginate, ciliate on the keels; anthers 2.5 mm long. July.

Meadows and slopes in valleys of river streams. -Centr. Asia: Dzung.-Tarb., Tyan'-Shan., Pam.-Al. Endemic. Described from Centr. Asia. Type in Tashkent, cotype in Leningrad.

20. *R. Komarovii* Nevski comb. nova. -*Agropyrum Komarovii* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 620.

Perennial. Culms erect or slightly geniculate at the base, 50-75 cm tall, smooth; sheaths smooth, sometimes the lower ones pilose; leaves flat, 0.4-0.8 cm broad, pilose and scabrous on the upper surface, scabrous and glabrous underneath. Spikes dense, 8.5-15 cm long, erect, subunilateral, rachis scabrous on the angles; spikelets 3-5-flowered, greenish-purple or green; glumes subequal, 0.8-1 cm long, 5-7-nerved, broadly lanceolate, slightly asymmetrical, abruptly pointed, sometimes 1-toothed at the summit, awned (awns 0.2-0.7 cm long), scabrous, scarious-margined; lemmas lanceolate, pilose, 1-1.2 cm long, prolonged into a straight, scabrous awn 0.8-1.5 cm long; palea nearly as long as the lemma 0.9-1.1 cm long, subobtuse or subemarginate, ciliate on the margin; anthers 2 mm long. June. (Plate XLV, Figure 4).

Meadows and slopes in river valleys. -West, Siberia: Alt.; East, Siberia: Ang.-Sayan.; Centr. Asia: Dzung.-Tarb. Gen. Distr.: Mong., Dzung.-Kashg. Described from the valley of Oka, between Gargan and Kashtak. Type in Leningrad.

Series 7. *Viridiglumes* Nevski. -Spikes rather dense, bilateral, 616 more or less nodding. Glumes shorter than the lowest floret, lanceolate or linear-lanceolate, 8-10 mm long, entire, 5-7-nerved, short-awned. Lemmas scabrous or pilose, awn usually as long as the lemma.

21. *R. viridiglumis* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. Culms bent at the base, 100-115 cm tall, puberulent at the nodes; sheaths scabrous, the lower ones scattered-pilose; leaves flat, glaucous-green, 0.5-0.7 cm broad, covered on the upper surface with long, white, implexed hairs, glabrous and scabrous on the lower surface. Spikes slightly nodding, 11-12 cm long; spikelets green or glaucous-green, 3-5-flowered; glumes lanceolate, or linear-lanceolate, rather gradually

acuminate, short-awned (awns to 4 mm long), 5-nerved, scabrous, 0.9-1 cm long. Lemmas turn yellow in maturity, while glumes remain green. Lemmas lanceolate, pilose, 1-1.1 cm long, prolonged into awn 0.7-1 cm long; palea pointed, almost imperceptibly emarginate. June-July.

Forest-steppe birch woods. -West. Siberia: Upp. Tob. Endemic. Described from the surroundings of the village Adzhitarovaya (by the Chelyabinsk - Zlatoust railroad). Type in Leningrad.

22. *R. taigae* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, 2 (1934).

Perennial. Culms 100-125 cm tall, glabrous, smooth; sheaths glabrous, smooth, the lower ones puberulent; leaves flat, to 0.7 cm broad, pilose on the upper surface, glabrous and scabrous underneath. Spikes rather dense, 10-17 cm long, slightly nodding or suberect; spikelets green or greenish-purple, 1.1-1.5 cm long, 3-5-flowered; glumes linear-lanceolate, gradually long-acuminate, awned (awns 0.3-0.5 cm long), 5-7-nerved, very scabrous, 0.8-1 cm long; lemmas lanceolate, scabrous or scabrous-hairy, 0.9-1 cm long, prolonged into awn 0.8-1.1 cm long; palea obscurely emarginate, ciliate on the margin. June-July.

West. Siberia: Ob' region. Endemic. Described from the surroundings of Bubeevye nomads encampment (Marinsko-Chulymskaya Taiga). Type in Leningrad.

Series 8. *Pendulinae* Nevski. -Spikes slender, rather pendent, with distant spikelets. Glumes shorter than the lowest floret, 5-9 mm long, lanceolate or linear-lanceolate, entire, acuminate, 5-nerved. Lemma with ciliate margin long-awned.

23. *R. pendulina* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, 2 (1934). -*Triticum caninum* f. *amurense* Korsch. A.H.P. XII (1892) 414.

Perennial. Loosely tufted; culms 70-110 cm tall; leaves green, flat, delicate, 0.6-1 cm broad, glabrous, very scabrous on both sides. Spikes long, 15-22 cm long, more or less pendulous or drooping, slender, loose, 617 rachis scabrous on the main angles; spikelets green, narrow, linear, 5-6-flowered, 1-3-2 cm long (excluding awns), appressed; glumes 0.6-0.9 cm long, lanceolate or linear-lanceolate, 5-nerved, acuminate, sometimes obscurely serrate at the summit, terminating in a short point, scabrous, slightly shorter than the lowest floret; lemmas lanceolate, 0.8-1 cm long, ciliate on the margin near the summit, sparsely appressed-setose on the back in upper part, prolonged into awn 1.5-2.3 cm long; palea as long as the lemma, rounded-subobtusate; anthers 2 mm long. June. (Plate XLV, Figure 6).

Forests, shrub thickets, osier-beds along rivers and brooks. -Far East: Ud., Ze.-Bur., Ussur. Gen. Distr.: Jap.-Chin. Described from the surroundings of the village Soyuznaya (on the Amur). Type in Leningrad.

24. *R. brachypodioides* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, 2 (1934).

Perennial. Culms 50-85 cm tall, slender, with pubescent nodes; leaf sheaths glabrous; leaves green, flat, thin-veined, very scabrous on both sides, glabrous. Spikes pendulous, weak, loose and slender, 6-12 cm long (excluding awns), appressed, 4-5-flowered, linear; glumes lanceolate, shorter than the lowest floret, 0.5-0.65 cm long, abruptly narrowed, sub-acute, 5-nerved, scabrous; lemmas lanceolate, 0.7-0.75 cm long, glabrous,

short-ciliate on the margin; awn very slender, straight or subflexuous, scabrous, 1.5-2 cm long. July.

Flood meadows. -East. Siberia: Ang. -Sayan. Endemic. Described from Nizhnii Island on the Yenisei River., near the village Potroshilovaya, Minusinskii Raion. Type in Leningrad.

Series 9. *Caninae* Nevski. -Spikes pendulous or more or less nodding, moderately dense or dense, bilateral. Glumes shorter than the lowest floret, 6-10 mm long, lanceolate, 3-(5)-nerved, entire, usually short-awned. Lemmas glabrous, long-awned.

25. *R. canina* (L.) Nevski comb. nova. -*Triticum caninum* L. Sp. pl. (1753) 86; Griseb. in Ldb. Fl. Ross. IV, 340. -*Goulardia canina* Husnot. Gram. Fran. (1899) 83. -*Agropyrum caninum* P. B. Agrost. (1812) 146; Shmal'g. Fl. II, 656; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 348. -*A. abchazicum* Woron. in Monit. Jard. Bot. Tifl., XXII (1912) 2. -Ic.: Rchb. Ic. Fl. Germ. I (1834) tab. 19.

Perennial. A loosely tufted, sciophilous plant; culms 75-150 cm tall, smooth; leaves thin, flat, broadly linear, 0.5-1.1 cm broad, green or glaucous-green, scabrous, glabrous, or scattered-pilose on the upper surface. Spikes rather dense, drooping or nodding, green or rarely greenish-purple, 10-20 cm long; spikelets 2-5-flowered, 1-1.5 cm long (excluding awns); glumes lanceolate, abruptly narrowed above, usually short-awned, 618 3-5-nerved, with broad internerves, scabrous, scarious-margined, unequal, the lower 0.6-1 cm long, with awn to 2 mm long, the upper 0.7-1.1 cm long, with awn 0.2-0.4 cm long; lemmas smooth, 0.9-1.1 cm long, awn flexuous, 1.5-1.8 cm long; anthers 2.5-2.8 mm long. June-July.

Forest. -European part: all regions; Caucasus: all regions; West. Siberia: Ob., Upp. Tob., Irt., Alt.; East. Siberia: Ang. -Sayan., Len. -Kol; Centr. Asia: Dzung. -Tarb., Tyan'-Shan., Pam. -Al. Gen. Distr.: Scand., Centr. and Atl. Eur., West. Medit., Balk. -As. Min., Arm. -Kurd., Iran. Described from Europe. Type in London.

Series 10. *Angustiglumes* Nevski. -Spikes dense, more or less unilateral, more rarely bilateral. Glumes usually narrow, linear-lanceolate or lanceolate, 5-7-nerved, rather unequal sided and often 1-toothed at the summit, 7-15 mm long and 1.5-2.5 (3) mm broad, tapering to an aristate point. Lemma scabrous or glabrous, short-awned. Leaves pilose on the upper surface, more rarely glabrous.

26. *R. angustiglumis* Nevski comb. nova. -*Agropyrum angustiglume* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 615. -*A. ilmense* Roshev. ex Nevski, l.c., p. 609, nom. nudum. -*A. mutabile* var. *scabrum* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XVI (1916) 88; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II 350. -*Triticum caninum* β *altaicum* Griseb. in Ldb. Fl. Ross. IV (1853) 340.

Perennial. Culms erect or slightly curved at the base, to 120 cm tall, glabrous or short-pubescent at the nodes; leaf sheaths glabrous, smooth; leaves flat, scabrous and covered with long hairs on the upper surface, scabrous and glabrous underneath. Spikes dense, 10-20 cm long, usually 1-sided, erect, rather intensely purple-tinged, rachis scabrous on the angles; spikelets 1.5-2.2 cm long, 3-5-flowered; glumes subequal, linear-lanceolate, 1.5-2 (2.3) mm broad, gradually narrowed into a short awn-point, very scabrous, 3-5-nerved, 0.8-1.3 cm long; lemmas 0.9-1.4 cm long, long-acuminate, short-awned (awn 2-5 mm in length), scabrous;

palea pointed or narrowly emarginate, nearly as long as the lemma, covered with very short hairs on the side facing the rachilla; anthers 2-2.5 cm long. June-July.

Mud flats and dry-river meadows. -Arctic: Arctic Sib. (northern Ural); European part: Kar.-Lap., Dv.-Pech.; West. Siberia: Ob., Irt., Alt.; East. Siberia: Ang.-Sayan., Daur., Len.-Kol; Far East: Kamch. Gen. Distr.: Scand., Mong., Dzung.-Kashg. Described from the river Balbana (Dv.-Pech.). Type in Leningrad.

R. angustiglumis Nevski $\times$ *R. canina* (L.) Nevski. -Spikes dense, bilateral. Glumes narrower than in *R. canina*, more gradually narrowed. Lemmas scabrous, with awn 0.7-1 cm long. -European part: Dv.-Pech., Kar.-Lap.

- 619 27. *R. kameczadalorum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. Culms erect or slightly curved at the base, 75-90 cm tall, scabrous below the nodes and the spike; sheaths scaberulous, more or less purple-tinged in lower part; leaves flat, green, 0.5-0.8 cm broad, with scattered hairs on the upper surface. Spikes dense, rather 1-sided, green, 10-16 cm long; spikelets (3) 5-7-flowered; rachilla covered with soft hairs; glumes lanceolate, to 3 mm broad, tapering to a small awn-point, scarious-margined, scabrous, 5-7-nerved, 0.9-1.5 cm long; lemmas lanceolate, glabrous, smooth, 1 cm long, with awn 0.15-0.4 cm long; palea as long as the lemma, emarginate; anthers 2.2 mm long. July.

Riverside meadows. -Far East: Kamch. Endemic. Described from the valley of the river Koryatskaya (Avacha River basin, village Koryaki). Type in Leningrad.

28. *R. oschensis* (Roshev.) Nevski comb. nova. -*Agropyrum oschense* Roshev. in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. A glaucous-green plant; culms slightly curved at the base, glabrous, smooth, 60-100 cm tall; leaves flat, finally subinvolute, scabrous, glabrous on both sides, glaucous-green. Spikes linear, slightly nodding or suberect, slender, 6-12 (13.5) cm long; spikelets 2-5-flowered, glaucous-green or greenish-purple; glumes linear-lanceolate or lanceolate, narrow, rather gradually tapering to a minute awn 0.1-0.2 cm long, 5-nerved, very scabrous, 0.7-1 cm long; lemmas scabrous, 0.8-0.9 cm long, with awn 0.2-0.3 (0.5) cm long; palea as long as the lemma, rather distinctly bidentate at the summit; anthers 3 mm long. June-July.

Mountain-river valleys, meadows and wooded slopes. -Centr. Asia: Dzung.-Tarb., Tyan'-Shan., Pam.-Al. Endemic. Described from the valley of river Dzhiptyk (Oshskii Raion). Type in Leningrad.

R. oschensis (Roshev.) Nevski $\times$ *Hordeum turkestanicum* Nevski. -(*Agropyrum* Pavlovii Nevski in Bull. Jard. Bot. Princ. URSS, XXIX (1930) 541). -A sterile hybrid. Spikes brittle, dark purple, dense, narrow, spikelets solitary, 2-flowered; glumes narrowly linear-lanceolate, subulate-pointed to a very short awn. Centr. Asia: Dzung.-Tarb., Tyan'-Shan.

Series 11. *Transbaicalenses* Nevski. -Spikes dense, more or less unilateral. Glumes lanceolate, 5-7-nerved, usually unequal-sided and 1-toothed at the apex, 8-11 mm long, abruptly narrowed to an aristate point. Lemmas pilose, short-awned. Leaves glabrous.

29. *R. transbaicalensis* Nevski comb. nova. - *Agropyrum transbaicalense* Nevski, Bull. Jar. Bot. Ac. Sc. URSS XXX (1932) 618. - *Agropyron mutabile* var. *pilosum* Drob. in Trav. Mus. Bot. Ac. Sc. Petrog. (1916) 89.

- 620 Perennial. Culms rather geniculate at the base, to 100 cm tall, smooth; sheaths smooth, or the lower ones retrorsely hairy; leaves glaucous-green, to 1-1.2 cm broad, glabrous on both sides, scabrous. Spikes glaucous-green or green, often 1-sided, erect, to 20 cm long, rachis scabrous on the angles; spikelets 3-5-flowered; glumes lanceolate or broadly lanceolate, often 1-toothed at the summit and asymmetrical, abruptly pointed sometimes terminating in a small awn-point, scarious-margined, scabrous, 5-7-nerved, 0.8-1.1 cm long; lemmas lanceolate, 0.85-1.1 cm long, pilose, with awn 0.1-0.3 cm long; palea as long as the lemma, emarginate, ciliate on the keels; anthers 2.5 mm long.

Mud flats. - West. Siberia: Alt.; East. Siberia: Daur., Ang.-Sayan. Endemic. Described from the valley of Upper Angara. Type in Leningrad.

Series 12. *Troctolepides* Nevski. - Spikes dense, more or less unilateral. Glumes lanceolate, erose or bluntly toothed at the summit, 5-7-nerved, 7-10 mm long, shorter than the lowest floret. Lemmas very short-pubescent or glabrous, obtuse.

30. *R. Buschiana* (Roshev.) Nevski comb. nova. - *Agropyrum Buschianum* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 301.

Perennial. Culms 50-75 cm tall, glabrous, smooth; leaves flat, green, 0.4-0.7 cm broad, scabrous, glabrous. Spikes dense, many-flowered, 1-sided to sub-bilateral; rachis and spikelets pruinose; spikelets glaucous-green, sometimes slightly purple-tinged, 1.2-1.5 cm long, 3-5-flowered; glumes lanceolate, erose at the summit, usually terminating in a small aristate point (extension of mid-nerve) at the middle of the notch, 2-3-toothed, 5-7-nerved, scabrous, 0.7-1 cm long, whitish-purple-hyaline on the margin; lemmas lanceolate, abruptly narrowed, 0.8-1 cm long, terminating in a very short awn-point (0.5 mm long), bidentate at the summit, puberulent; palea slightly shorter than the lemma, almost imperceptibly emarginate; anthers 2 mm long. July.

Mountain meadows and slopes. - Caucasus: Ciscauc., East. Transcauc. Endemic. Described from Adir and Irik gorges. Type in Leningrad.

31. *R. troctolepis* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. Strongly canescent plants; culms 100-110 cm tall, smooth; leaf sheaths glaucous-green, smooth; leaves flat, 5-7 mm broad, scabrous, destitute of hairs. Spikes 6.5-17 cm long, dense, 2-sided, rachis scabrous on the angles; spikelets glaucous-purplish-green, 1.2-1.8 cm long, 4-5-flowered, with hairy rachilla; glumes rather erose or dentate at the summit, 7-9 mm long, 5-nerved; lemmas lanceolate, 5-nerved, emarginate or dentate at the summit, obtuse, glabrous or scarcely scabrous above, canescent, 1-1.1 cm long; palea shorter than the lemma, 0.8-0.85 cm long, scarcely emarginate, subobtuse. July-August.

Mountain slopes. -Caucasus: West, Transcauc. Endemic. Described from Mount Akhibok in Abkhaziya. Type in Leningrad.

Series 13. *Praeacaespitosae* Nevski. -Spikes erect or slightly nodding, bilateral, rather loose. Glumes lanceolate, 5-7-nerved, entire, 7-11 mm long, acuminate; lemmas glabrous or scabrous, short-awned. Culms very rigid at the base, forming compact tufts.

32. *R. leptoura* Nevski in Act. Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Culms 40-75 cm tall, glabrous, smooth; leaves glaucous-green, sub-involute, more rarely subplane with inrolled margins, narrowly linear, to 3-4 mm broad, short-pubescent on the upper surface, smooth underneath. Spikes loose, 7-14.5 cm long, green or faintly purple-tinged; spikelets 3-5-flowered, appressed, 1-1.7 cm long; glumes lanceolate or linear-lanceolate, unequal, (0.6) 0.7-1.1 cm long, acuminate, sometimes terminating in an awn-point 0.5 mm long, 5-7-nerved, very scabrous on the nerves; rachilla and callus hairy; lemmas lanceolate, 0.85-1.1 cm long, glabrous, tapering to a scabrous awn 2-4 (5) mm long; palea 0.8-1 cm long, emarginate, ciliate on the keels; anthers 3.5-4 mm long. June-July.

Stony mountain slopes. -Caucasus: South, Transcauc. (Karabakh); Centr. Asia: Pam., -Al. (Zeravshan), Upp. Turkm. Described from Mount Chapan-dag (Kopet-Dag). Type in Leningrad.

NOTE. Belongs to the same series of species as *R. praeacaespitosa* Nevski which occurs in Chinese Turkestan.

Series 14. *Boreales* Nevski. -Spikes erect, bilateral or sub-bilateral, rather intensely purple-tinged. Glumes lanceolate or broadly lanceolate, whitish-purple-hyaline on the margin, unequal-sided at the summit, abruptly narrowed to a small aristate point, scaberulous. Lemmas glabrous, more rarely scabrous, short-awned. Rachilla glabrescent.

624 33. *R. sajanensis* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. A tufted, low plant; culms 25-35 cm tall, leafy all the way up; leaves scabrous, glabrous, more rarely hairy, 0.25-0.5 cm broad; the uppermost leaf close to base of the spike. Spikes 4.5-7 cm long. Spikelets 2-3-flowered, 1-1.3 cm long; Glumes 0.6-0.8 cm long, broadly lanceolate, abruptly narrowed to an aristate point to 1 mm long, asymmetrical above, purplish-hyaline on the margin, 3-5-nerved, scabrous on the nerves; lemmas lanceolate, roughened with small appressed bristles which are more numerous on the sides and above, almost smooth on the back below, rarely scaberulous only in upper part, 5-nerved, abruptly narrowed, 0.8-1 cm long, with awn 1-2 mm long, bidentate at the base of the awn; palea lanceolate, obtusely pointed, ciliate on the keels; anthers 2 mm long. July-August.

Meadows at the foot of bare Siberian hills. -East, Siberia: Ang.-Sayan. Gen. Distr.: Mong. Described from Garganskii Pass (Ola River). Type in Leningrad.

34. *R. borealis* (Turcz.) Nevski comb. nova. -*Triticum boreale* Turcz. Fl. baic.-dah. II, 1 (1856) 345. -*Agropyron boreale* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XVI (1916), tab. 9, fig. 1. -*A. mutabile* var. *glabrum* Drob., l.c., p. 87, pro parte. -*A. kronokense* Kom. in Fedde, Repert. sp. nov. XIII (1915) 87. -*A. repens* var. *Hornemanni* Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II (1928) 353, excl. syn. - *A. violaceum* auct. fl. sib., pro max. parte, non Vasey.

Perennial. Culms erect, slender, (20) 30-60 cm tall, smooth; leaves short, narrow, 0.15-0.25 mm broad, flat, hairy on the upper surface, glabrous scabrous underneath; uppermost leaf 5.5-9 cm long, not close to base of the spike. Spikes 4-8 cm long, erect; spikelets purple or greenish-purple, 0.9-1 cm long, 2-flowered, more rarely 3-flowered; glumes lanceolate or broadly lanceolate, (0.4) 0.5-0.7 cm long, 0.15-0.25 cm broad, unequal-sided and sometimes bluntly toothed, abruptly narrowed into an awn-point to 1 (3) mm long, 3-5-nerved, scabrous or glabrescent on the nerves, purplish- or whitish-purplish-hyaline on the margin; lemma lanceolate, smooth, 0.7-0.8 cm long, with awn 2-4 (5) mm long; palea as long as the lemma, slightly emarginate, ciliate on the keels. June-July.

Meadows in river- valleys and in the alpine zone. -Arctic: Arctic Sib.; European part: Dv.-Pech.; West. Siberia: Alt.; East. Siberia: Ang.-Sayan, Len.-Kol; Far East: Kamch. Described from the valley of river Aldan. Type in Leningrad.

35. *R. scandica* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934). -*Agropyron latiglume* auct. fl. scand., non Rydb. -*Triticum violaceum* auct. fl. scand., pro parte, non Hornm.

- 625 Perennial. Culms 30-45 cm tall, glabrous, erect or slightly bent at the lower nodes; the lower sheaths sparsely retrorse-hairy; leaves green or glaucous-green, entirely glabrous, very rarely somewhat pilose, scabrous, 0.2-0.4 cm broad. Spikes erect, 4-8 cm long, broader than in *R. borealis*. Spikelets purple, 2-4-flowered, 1-1.5 cm long; glumes broadly lanceolate, (0.5), 0.6-0.9 (1) cm long, 0.18-0.25 (3) mm broad, (3)-5-nerved, scabrous on the nerves, abruptly narrowed into a point 1 mm long, often asymmetrical, purplish-hyaline on the margin; lemmas lanceolate, smooth and glabrous, scabrous on the nerves only just below the awn, 0.8-0.9 cm long, with awn 2-4 mm long, bidentate below the awn; palea as long as the lemma, ciliate on the keels; anthers 2 mm long. (Plate XLV, Figure 1).

Riverside meadows. -European part: Kar.-Lap. Gen. Distr.: Scand. Described from Kol'skii Peninsula. Type in Leningrad.

Series 15. *Fibrosae* Nevski. -Spikes arcuately nodding, rather loose. Glumes lanceolate, 5-7 (8) mm long, about half as long as the lowest floret, acuminate, usually 3-nerved. Lemma awnless, glabrous. Rachilla hairy.

36. *R. fibrosa* (Schrenk) Nevski comb. nova. -*Triticum fibrosum* Schrenk in Bull. Phys.-Math. Acad. Petersb. II (1845) 209. -*Agropyrum fibrosum* Nevski in Bull. Jard. Bot. Princ. URSS, XXIX (1930) 538.

Perennial. Culms erect or slightly geniculate at the base, slender, 40-70 cm tall; leaves linear, 0.3-0.7 cm broad, scabrous, glabrous, more rarely the nerves very slightly hairy on the upper side. Spikes 2-sided, arcuate-drooping, 6-10 cm long; spikelets 2-3 (5)-flowered, greenish-purple or green, (0.9) 1-1.3 (1.5) cm long; glumes subequal, lanceolate, acuminate, scabrous, 0.5-0.7 (0.8) cm long, shorter than the lowest floret; lemmas lanceolate, subulate-acuminate, glabrous, 5-nerved, 0.9-1.1 cm long; palea nearly as long as the lemma, 0.85-1 cm long, ciliate on the keels; anthers 2 mm long. June-July.

Mud flats. -European part: Upp. Volg., Dv.-Pech., Volg.-Kam., Volg. Don., Zavolzh.; West. Siberia: Upp. Tob., Ob., Irt. Endemic. Described from Karkaralinsk Mountains. Type in Leningrad.

Series 16. *Pubescentes* Nevski. - Spikes erect or slightly nodding, slender, to 15 cm long, with scattered hairs. Glumes acuminate, small, 5-9 mm long, 3-5-nerved, lanceolate or linear-lanceolate. Lemmas awned, the awn 0.5-1.2 cm long, hairy.

37. *R. jacutensis* (Drob.) Nevski comb. nova. - *Agropyron jacutense* Drob. in Trav. Mus. Bot. Acad. Sc. Petrogr. XVI (1916) 94, tab. 9, fig. 5. - *A. Tugarinovii* Reverdatto in Animad. Syst. ex Herb. Univ. Tomsk (1932) no 4, p. 1.

- 626 Perennial. Culms 40-70 cm tall, slender, erect or geniculate at the lower nodes; sheaths of lower leaves pubescent; leaves glaucous-green or green, flat, narrowly linear, 0.2-0.4 cm broad, entirely glabrous, scabrous on the upper surface, practically smooth underneath. Spikes erect or slightly nodding, very slender, 7-15 cm long, with rather remote spikelets; spikelets greenish-purple, more rarely green, dilated toward the apex, 1.5-1.7 cm long, the lower spikelets rather remote (the lower internodes of the spike (1.2) 1.5-3 cm, the upper ones 0.8-1.2 cm long), 5-7-flowered; glumes lanceolate or linear-lanceolate, narrow, sublaterally long-acuminate or short-awned, shorter than the lowest floret, 0.5-0.9 cm long, nearly smooth or scabrous on the nerves, scarious-margined, sometimes dentate at the apex; lemmas linear-lanceolate, short-pilose only below or, more rarely, all the way up, 0.8-1.1 cm long, prolonged into awn 0.5-1 cm long; palea as long as the lemma; anthers 1.8 mm long. July.

Meadows and river-valley gravels. - Arctic: Arctic. Sib., Anad.; East. Siberia: Len.-Kol. Endemic. Described from Yakutiya. Type in Leningrad.

38. *R. pubescens* (Trin.) Nevski comb. nova. - *Triticum pubescens* Trin. ex Bunge in Mém. pres. Acad. St. Pétersb. II. 6 (1835) 528. - *Agropyrum pubescens* Schischk. in Animad. syst. Herb. Univ. Tomsk, No 2, (1928) 1; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II 351.

Perennial. Loosely tufted; culms 45-75 cm tall, slender, smooth; leaves flat green, 2-4 mm broad, scabrous, glabrous. Spikes erect or slightly nodding, 7-13 cm long, loose; spikelets green, remote (distance between lower spikelets 1.5-2.5 cm, between upper spikelets 0.8-1 cm), 3-5-flowered, 1.5-1.7 cm long; rachilla covered with long hairs; glumes 0.5-0.8 cm long, linear-lanceolate, acuminate, sometimes terminating in a short aristate point, 3-5-nerved, almost smooth, scarious-margined; lemmas lanceolate, covered with long, soft hairs, 0.9-1 cm long, awn 0.5-1.2 cm long; palea linear-lanceolate, subobtusate or scarcely emarginate; anthers 1.5-1.8 mm long. July.

Sandy and gravelly river banks, riverside meadows. - West. Siberia: Alt. Endemic. Described from mountains along Charysh River. Type in Leningrad.

Series 17. *Latiglumes* Nevski. - Spikes often very long, with spikelets very remote near the base, more rarely shorter and rather loose, erect. Glumes shorter than the lowest floret, 4-10 mm long, 3-5-(7)-nerved, lanceolate, subobtusate to subacute. Lemmas awnless or terminating in a short aristate point, rather pilose (especially in lower part).

39. *R. turuchanensis* (Reverdatto) Nevski comb. nova. - *Agropyrum turuchanense* Reverdatto in Animadvers. syst. Herb. Univ. Tomsk. No 4 (1932) 2.

Perennial. Culms 25-45 cm tall, geniculate at the base, smooth; leaf sheaths smooth; leaves flat, hairy on the upper surface and frequently
627 also on the lower surface, 2-4 mm broad. Spikes erect, 5-9 cm long; spikelets 6-9, greenish-purple, 3-5-flowered, 1-1.5 cm long; glumes small, half as long as the lowest floret, lanceolate, obtuse, rounded or asymmetrical and bluntly toothed at the summit, hyaline-margined, 3-4-nerved, scaberulous, 0.4-0.6 (0.7) cm long; lemmas lanceolate, pubescent, acuminate, awnless or terminating in a point to 1 mm long; palea as long as the lemma, emarginate; anthers 1.5 mm long. July.

River banks. -Arctic: Arctic Sib. Endemic. Described from the lowlands of the river Yenisei. Type in Tomsk.

40. *R. macroura* (Turcz.) Nevski comb. nova. -*Triticum macrourum* Turcz. Bull. Sc. Nat. Mosc. XXIX I (1856) 59. -*Agropyrum macrourum* Drob. in Trav. Mus. Bot. Ac. Sc. Petrogr. XVI (1916) 86; tab. 9, fig. 2.

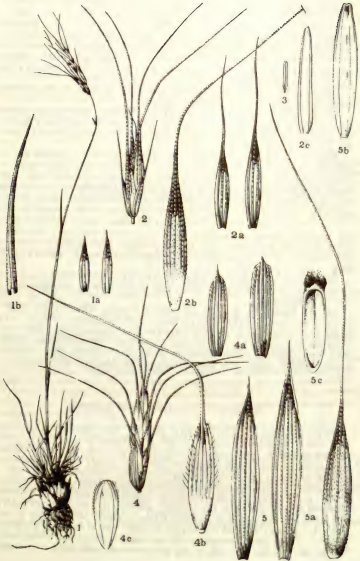
Perennial. Rhizome creeping; culms 35-95 cm tall, glabrous and smooth; leaves green, 0.3-0.7 cm broad, scabrous, glabrous. Spikes erect, loose, (6-12) 15-30 cm long, narrow, with very remote spikelets (especially the lower ones which are usually spaced 2-3.5 cm apart); spikelets pale green, (1.1) 2-2.1 cm long, (3)-5-7-flowered, appressed; rachilla pubescent; glumes lanceolate, (0.5) 0.7-1 cm long, 3-5-nerved, scaberulous on the nerves, nearly smooth, narrowed to a small point, scarious-margined; lemmas lanceolate, tapering into a short awn 1 mm long, pilose in lower part, the hairs fewer and shorter in upper part, glabrous and bidentate below the awn; palea acuminate, ciliate on the keels; anthers ca. 2 mm long. July-August. (Plate XLV, Figure 2).

Sandy shallows in river valleys. -Arctic: Arctic Sib., Anad.; East. Siberia: Daur., Len. -Kol. Endemic. Described from the valley of Upper Angara. Type in Leningrad.

NOTE. Apparently the only species of the genus *Roegneria* with creeping rhizomes, this being in agreement with its unique ecology. It has so far been described as a tufted plant devoid of creeping rhizomes, this being due to inadequacy of herbarium specimens. The arctic race of *R. macroura* differs rather strikingly in its habit from the type. This is a much smaller plant, with smaller spikes and relatively few spikelets.

Genus 197. AGROPYRUM GAERTN.

Subgenus 1. *ELYTRIGIA* Desv. in Nouv. Bull. Soc. philom. II (1810) 191; Journ. de Botan. II (1813) 74, pro gen. -Spikes always erect, with solitary spikelets. Spikelets 3-11-flowered, perfectly sessile, awnless,
628 more rarely awned; awns very short, straight, rarely long and divaricate. Glumes lanceolate, linear-lanceolate, or oblong, keelless; nerves (3) 5-11, approximate, smooth (only mid-nerve sometimes faintly scabrous above), more rarely glumes soft-hairy; lemmas lanceolate, the 5 nerves connivent or subconnivent at the summit, glabrous or, more rarely, hairy, with a shallow transverse furrow and a small, short, naked callus at the base. Lodicules ciliate on the margin or hairy also at the top. Anthers (3.5) 4-7 (8) mm long, exceeding half the length of the palea. Caryopsis oblong, hairy on the top, with a deep groove on the inner side. Perennial



plants with long, creeping rhizomes, or densely-tufted with short creeping rhizomes or without rhizomes. Leaves involute, more rarely flat, hairy or scabrous on the upper surface, usually smooth underneath, faintly glaucous or glaucous-green.

ECONOMIC IMPORTANCE. As opposed to the genus *Rogneria*, the subgenus *Elytrigia* (Desv.) of the genus *Agropyrum* Gaertn. contains a number of valuable forage grasses. Hay obtained from *A. repens* is considered in the U. S. S. R. as one of the best. The most valued mountain pastures in Central Asia are those which contain a large amount of *Agropyrum trichophorum* (Link) Richt. *A. intermedium* (Host) P. B. is also a valuable forage plant, while a number of other species not yet tested in practice, such as *A. lolioides* (Kar. et Kir.) Roshev., *A. elongatiforme* Drob., *A. ciliolatum* Nevski, will undoubtedly gain appreciation in the future. The forage value of *A. Smithii* Rydb. has long been recognized in America, as this plant compares favorably in quality with timothy. In the U. S. S. R. wild-growing species of *Agropyrum* are grazed and cut in natural meadows and in fallows. The spread of wheat grasses in cultivation is somewhat hampered by the difficulty of obtaining seed. Their sexual reproduction seems to be depressed and antagonistic to vegetative reproduction, as seeds are as a rule produced infrequently and in small quantity. On the other hand, the vegetative spread of wheat grasses proceeds vigorously by means of the long, creeping rhizomes.

- 629 1. Awns straight, 0.2-0.6 cm long, or spikelets awnless 2.
 + Awns divaricate, 0.5-2.5 cm long 29.
 2. Lemmas more or less hairy 3.
 + Lemmas perfectly glabrous, smooth 6.
 3. Glumes hairy over their entire surface, oblong-lanceolate or lanceolate, obtuse to subacute, usually obliquely truncate and sometimes dentate. Lemmas covered with long white hairs at the summit and on the margin, glabrous below and on the back 4.
 + Glumes ciliate only on the mid-nerve, or glabrous and smooth, lanceolate, pointed. Lemmas hairy over the whole surface 5.
 4. Lemmas awnless, subobtuse
 31. *A. trichophorum* (Link) Richt.
 + Lemmas with a straight awn to 0.9 (1) cm long
 32. *A. pulcherrimum* Grossh.
 5. Glumes ciliate on the mid-nerve
 35. *A. krylovianum* Schischk.
 + Glumes glabrous, smooth, scaberulous only at the summit and on the nerves 3. *A. alatiavicum* Drob.
 6. Glumes ciliate on the mid-nerve 7.
 + Glumes glabrous 8.

Explanation to Plate XLVI

1. *R. schugnanica* Nevski: general view of the plant; 1 a) lower and upper glume, 1 b) leaf apex. -
 2. *R. himalayana* Nevski: spikelet; 2 a) lower and upper glume; 2 b) lemma, 2 c) palea. -3. *R. celtigamica* (Drob.) Nevski: anthers. -4. *R. ciliaris* (Trin.) Nevski: spikelet; 4 a) lower and upper glume; 4 b) lemma; 4 c) palea. -5) *R. curvata* Nevski: lower and upper glume; 5 a) lemma; 5 b) palea; 5 c) caryopsis.

7. Plants 70 cm tall; spikes 12 cm long; glumes (0.3) 0.4-0.45 cm long 33. *A. ciliolatum* Nevski.
- + Plants 15-24 cm tall; spikes 3-3.5 cm long; glumes (0.4) 0.5-0.55 (0.6) cm long 34. *A. pumilum* (Steud.) Nevski.
8. Rachis of spike disarticulating, quite smooth on the ribs. 29. *A. junceum* (L.) P.B.
- + Rachis of spike continuous, with more or less ciliate or scabrous main angles 9.
9. Plants with extensively creeping long rhizomes, not forming dense tufts 10.
- + Densely tufted plants, without creeping rhizomes, or with tufts joined by means of short, creeping rhizomes 13.
10. Glumes tapering to a short awn-point or a short awn, or subulate-tipped, faintly scaberulous above on the mid-nerve 38. *A. repens* (L.) P.B.
- + Glumes obtuse, obliquely truncate, or rounded-obtuse, smooth all the way up 11.
11. Glumes somewhat obliquely truncate, obtuse, oblong 30. *A. intermedium* (Host) P.B.
- + Glumes rounded-obtuse or subobtuse, not truncate, lanceolate or ovate-lanceolate 12.
12. Palea minutely ciliate on the keels. Mid-nerve of the lemma not excurrent 37. *A. elongatiforme* Drob.
- + Palea long-ciliate on the keels. Mid-nerve of lemma excurrent into a short, thickish point ... 36. *A. lolioideus* (Kar. et Kir.) Roshev.
- 630 13. Glumes 3-nerved, subulate-tipped ... 24. *A. Sosnovskyi* Hack.
- + Glumes 5-7-nerved 14.
14. Awn of lemma 0.5-2 mm long (rarely somewhat longer) 23. *A. geniculatum* (Trin.) Korsh.
- + Lemmas awnless 15.
15. Internodes of the rachis on the side facing the spikelets flat or nearly so (rachis appears flattened). Glumes obtuse, seemingly truncate. 16.
- + Internodes of the rachis on the side facing the spikelets grooved (rachis more or less cylindrical). Glumes pointed, subobtuse or obtuse 19.
16. Spikelets large, 1.4-2.5 cm long, 5-8-(11)-flowered. A large plant, with stout culms 28. *A. elongatum* (Host) P.B.
- + Spikelets relatively small, 1-1.5 (1.8) cm long, 3-5-flowered. A slender, graceful plant 17.
17. Leaves distinctly short-pubescent on the upper surface 25. *A. firmiculmis* Nevski.
- + Leaves glabrous, scaberulous on the upper surface 18.
18. Lower glume 0.6-0.8 cm long, upper glume 0.7-0.95 cm long. Spikelets 3-(5)-flowered 26. *A. caespitosum* C. Koch.
- + Lower glume 0.4-0.55 (0.6) cm long, upper glume 0.5-0.7 cm long. Spikelets 3-5-flowered 27. *A. nodosum* (Stev.) Nevski.
19. Culm below the spike and rachis very rough owing to abundant appressed bristles 22. *A. setuliferum* Nevski.
- + Culm below the spike perfectly glabrous. Rachis rough only on the two main ribs 20.
20. Lemmas slightly emarginate 16. *A. sinuatum* Nevski.
- + Lemmas not emarginate 21.

21. Culms scaberulous at the lower nodes and below them, very slender. Glumes 0.3-0.7 cm long. 17. *A. perienue* (C.A.M.) Nevski.
 + Culms smooth below the nodes. Glumes often longer. 22.
22. Sheaths of upper and lower leaves glabrous on the margin, not ciliate. 23.
 + Leaf sheaths (especially the lower ones) ciliate on the margin. 27.
23. Plants covered with a hoary bloom which rubs off easily. Leaves very short-pubescent on the upper surface. 19. *A. pruiniferum* Nevski.
 + Glaucous-green plants, without effaceable hoary bloom. Leaves hairy on the upper surface, more rarely glabrous. 24.
- 631 24. The intermediate nerves of the lemma connivent with the mid-nerve at the apex. Leaves usually glabrous on the upper surface, scabrous. 21. *A. ferganense* Drob.
 + The intermediate nerves of the lemma connivent with mid-nerve slightly (ca. 0.75-1 mm) below the apex, lower than the marginal nerves. Leaves always hairy on the upper surface. 25.
25. Spikelets small, (0.8) 0.85-1.1 cm long, 3-4-flowered. Palea almost imperceptibly ciliate on the keels in the upper 2/3. 18. *A. armenum* Nevski.
 + Spikelets large, 1-1.7 cm long, (3)-4-7-flowered. Palea short-ciliate on the keels in upper half. 26.
26. Rachis almost entirely smooth, scaberulous only on the two main angles in the upper part of its internodes. Lower glume (0.4) 0.5-0.7 cm long, upper glume (0.55) 0.6-0.8 cm long. 20. *A. dschungaricum* Nevski.
 + Rachis very scabrous on the two main angles. Lower glume 0.6-0.8 (0.9) cm long, upper glume (0.75) 0.8-1 (1.2) cm long. 14. *A. gracillimum* Nevski.
27. Leaves glabrous, scaberulous on the upper surface. 12. *A. stipaeifolium* Czern.
 + Leaves hairy or short-pubescent on the upper surface. 28.
28. Glumes oblong, only slightly attenuate from the base, obtuse, the lower 0.4-0.6 cm long, the upper 0.6-0.8 cm long. 15. *A. angulare* Nevski.
 + Glumes lanceolate, subobtuse, the lower (0.5) 0.6-0.8 cm long, the upper 0.7-1 cm long. 16. *A. scythicum* Nevski.
29. Glumes and lemmas entirely glabrous. Awns 1-2.5 cm long. 30.
 + Glumes and lemmas more or less covered with soft hairs. Awns 0.5-1.4 cm long. 37.
30. Awn of lemma weakly divergent at an obtuse angle. Glumes tapering into awns 2.5-6 mm long. 11. *A. attenuatiglume* Nevski.
 + Awns of lemmas strongly divergent at a right or nearly right angle. Glumes awnless, rarely awned. 31.
31. Glumes very small, 1/5-1/4 as long as the lowest floret, abruptly attenuate, subobtuse, rarely subacute. 32.
 + Glumes slightly shorter than the lowest floret, subobtuse to subacute, or awned. 34.
32. Leaves covered with long hairs on the upper surface. Plants 60-85 tall. 8. *A. jacutorum* Nevski.
 + Leaves glabrous, scabrous on the upper surface, rarely the upper ones covered with shorter hairs. Plants 15-20 cm tall. 33.

- 632 33. Spikelets purple or greenish-purple. Leaves flat, rarely with inrolled margins 7. *A. Roshevitzii* Nevski.
 + Spikelets glaucous-green; leaves setaceous-involute 8. *A. Gmelinii* Schrad.
34. Glumes long-acuminate or short-awned (awns 0.5-4 mm long) 6. *A. propinquum* Nevski.
 + Glumes awnless, subobtusate, more rarely subacute 35.
35. Awns of lemmas scaberrulous owing to sparse spinescent bristles. Spikelets (1) 1.1-1.3 (1.5) cm long (without awns) 4. *A. strigosum* (M.B.) Boiss.
 + Awn of lemmas very scabrous owing to abundant spinose bristles. Spikelets 1.4-2 (2.4) cm long 36.
36. Rachis nearly smooth. Glumes subobtusate 5. *A. reflexiaristatum* Nevski.
 + Rachis very scabrous on the two main angles. Glumes subacute. 10. *A. amgunense* Nevski.
37. Spikes ovate-linear or short-linear, 2.5-6.5 cm long, very dense 1. *A. Batalinii* (Krassn.) Roshev.
 + Spikes linear, 6-10.5 cm long; the lower spikelets subremote 2. *A. alaicum* Drob.

Section 1. *Hyalolepis* Nevski. -Awn divaricate, 0.5-1.4 cm long, rarely shorter, 0.2-0.3 cm long and straight. Glumes broadly scarious-margined, lanceolate or ovate-lanceolate, cuneate-tipped. Lemmas copiously covered with soft hairs. Densely tufted plants.

Series 1. *Hyalanthae* Nevski. -Lemmas prolonged into a more or less divaricate awn 0.6-1.4 cm long.

1. *A. Batalinii* (Krassn.) Roshev. in Bull. Jard. Bot. Pierre Gr. XIV. Suppl. II (1915) 96. -*Triticum Batalinii* Krassn. in Scripta Bot. Univ. Petrop. II, 1 (1887-1888) 21.

Perennial. Culms 18-40 cm tall, leaves short, subinvolute, glaucous-green, to 3 mm broad at the base, sheaths glabrous, rarely hairy, or ciliate on the margin, blades hairy on the upper surface, smooth or short-pubescent on the underside. Spikes (2.5) 3.5-6.5 cm long, 0.7-1 cm broad, greenish-purple, grayish owing to numerous hairs, very dense; spikelets 3-5-flowered, 0.9-1.35 cm long (excluding awns); glumes 0.5-0.7 cm long, ovate-lanceolate, tapering to a small awn-point, long-ciliate on all 5 nerves, with a semi-transparent, white, membranaceous margin; lemmas densely villous, prolonged into a subdivaricate awn 0.5-1.3 cm long; palea lanceolate, 0.6 cm long, ciliate on the keels; anthers 3 mm long. June-July.

- 633 Stony mountain-slopes. -Centr. Asia: Tyan'-Shan., Pam.-Al. Gen. Distr.: Dzung. -Kashg. Described from the Sara-Yassa River valley. Type in Leningrad.

2. *A. alaicum* Drob. in Trav. Mus. Bot. Acad. Sc. Petrogr. XVI (1916) 138.

Perennial. Culms 40-70 cm tall, pubescent below the spikes; sheaths smooth; leaves subinvolute, to 3 mm broad, covered with short hairs on the upper surface, smooth underneath. Spikes dense, 6-10 cm long, with pubescent rachis; spikelets 3-5-flowered, 1.3-1.5 cm long (excluding awns), greenish-purple; glumes lanceolate, 0.6-0.9 cm long, tapering to a short awn-point, 3-5-nerved, ciliate on the mid-nerve and sometimes on lateral nerves as well; lemmas covered with soft hairs, 0.7-1 cm long, prolonged

into a subdivaricate awn 0.9-1.4 cm long; palea lanceolate, as long as the lemmas, ciliate on the keels. June-July.

Stony slopes. -Centr. Asia: Pam.-Al. Endemic. Described from the river Karakazyk (Fergana). Type in Leningrad.

Series 2. *Albomarginatae* Nevski. -Lemmas prolonged into a short, straight or nearly straight awn 0.2-0.3 cm long.

3. *A. alatavicum* Drob. in Fedde, Repert. sp. nov. XXI (1925) 43.

Perennial. Densely tufted; culms 35-75 cm tall, glabrous or sometimes puberulent at the nodes, erect or slightly geniculate at the base; leaves glaucous-green, narrow, to 4 mm broad, subinvolute, scabrous on the upper surface and on the margin, smooth underneath. Spikes erect, dense, green or somewhat greenish-purple, rachis scabrous on the main angles; spikelets 1-1.2 cm long, 3-5-flowered; glumes lanceolate, cuneate-tipped with an awn-point 1 mm long, 5-nerved, smooth, scabrous only on the nerves above, broadly semi-transparent-scarious on the margin; lemmas lanceolate 0.75-0.9 cm long, prolonged into an awn, appressed-hairy, the awn sometimes slightly recurved or contorted, 2-3 mm long; palea lanceolate, subobtusate, ciliate on the keels, 0.75-0.8 cm long; anthers 4 mm long. June-July.

Stony slopes. -Centr. Asia: Dzung.-Tarb., Tyan'-Shan. Endemic. Described from the valley of river Chilik. Type in Tashkent.

Section 2. *Pseudoroegneria* Nevski. -Awns long (1-2.5 cm), divergent at an obtuse or nearly right angle. Lemmas glabrous. Glumes also glabrous. Tufted plants, with short, creeping rhizomes.

Series 1. *Strigosae* Nevski. -Awns strongly divergent, at a right or nearly-right angle.

4. *A. strigosum* (M.B.) Boiss. Fl. Or. V (1864) 661. -*Bromus strigosus* M.B. Fl. taur.-cauc. III (1819) 81-82.

- 634 Perennial. Culms slender, erect, to 50-60 cm tall, smooth; leaves narrowly linear, involute, more rarely subinvolute, to 3 mm broad, glaucous, very short-pubescent on the upper surface, smooth underneath. Spikes (5) 7.5-12 (16) cm long, erect, slender, rachis scaberulous on the angles; spikelets appressed, slightly longer than the internodes of the rachis (1) 1.1-1.3 (1.5) cm long (excluding awns), 0.2-0.4 (0.5) cm broad, (3)-4-5-flowered, glaucous-green; rachilla glabrous; glumes slightly unequal, linear-lanceolate, smooth, pointed, 5-7-nerved, slightly shorter than the lowest floret, (0.4-0.5) 0.6-0.8 (0.9) cm long; lemmas linear-lanceolate, smooth, prominently 5-nerved in upper part, 0.75-0.9 cm long. Awn 1-1.7 (2.2) cm long, 1 1/2-2 times as long as the lemma, scaberulous, covered with few, very short, spinulose bristles; palea as long as the lemma, ciliate above on the keels. June.

Stony slopes. -European part: Crimea. Endemic. Described from the vicinity of Yalta. Type in Leningrad.

5. *A. reflexiaristatum* Nevski in Bull. Jard. Bot. Ac. Sc. URSS. XXX (1932) 495. -*Triticum strigosum* Lessing in Linnaea IX (1834) 210, non *A. strigosum* Boiss.

Perennial. Culms erect, slender, to 80 cm tall; leaves rather glaucous, involute, more rarely subplane, to 4 mm broad, relatively short-pubescent or hairy on the upper surface, smooth underneath. Spikes (6.5) 8-14 (18) cm long, slender, subcylindrical rachis nearly smooth. Spikelets subdivergent, somewhat longer than or as long as the internodes of the rachis, 1.4-2 (2.4) cm long (excluding awns), 0.25-0.7 cm broad, (3)-5-7-flowered,

glaucous-green glumes slightly unequal, smooth, linear-lanceolate or lanceolate, subobtus, 5-7-nerved, slightly shorter than the lowest floret, (0.5) 0.6-0.95 cm long; lemmas 0.8-1 cm long, prominently 5-nerved in upper part, smooth; awn 1.2-2.5 cm long, very scabrous, copiously covered with spinulose bristles; palea as long as the lemma; anthers 5.5-6 mm long, much exceeding half the length of the palea. June-July.

Stony slopes and rocks. -European part: Volg.-Kam. (Ural). Endemic. Described from Il'minskii Mountains. Type in Leningrad.

6. *A. propinquum* Nevski, in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 498, fig. 3. -*A. stenophyllum* Nevski, l.c., p. 500.

Perennial. Culms erect or slightly curved at the base, 35-65 cm tall; leaves involute, glaucous-green, more rarely flat, to 3 mm broad, with inrolled margins, very short-pubescent on the upper surface, smooth underneath. Spikes erect, 7.5-11 cm long, rachis very scabrous on the main angles; spikelets subdivergent, 1.3-1.8 cm long (excluding awns), glaucous-green or slightly purple-tinged, 5-7-flowered; glumes linear-lanceolate, unequal, nearly as long as the lowest floret, the upper 0.7-1 cm long (excluding awn), the lower 0.6-0.9 cm long, gradually long-acuminate or 635 tapering to an awn 0.5-4 mm long, smooth, 5-6-nerved, more rarely 3-5-nerved (f. *stenophyllum* Nevski); lemmas 1-1.1 cm long, awns (1.3) 1.5-2.3 cm long, very scabrous; palea linear-lanceolate, subobtus, 0.9-1 cm long; anthers 6 mm long, much exceeding half the length of the palea. June-July.

Stony slopes and rocks. -West, Siberia: Alt.; Centr. Asia: Tyan'-Shan. (eastern). Gen. Distr.: Dzung. -Kashg. -Described from the Saur Range. Type in Leningrad.

7. *A. Roshevitzii* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 503.

Perennial. A tufted plant, with short rhizomes; culms glabrous, smooth 15-40 (50) cm tall; leaves glaucous-green, flat or with inrolled margins, 2-3 mm broad, scabrous on the upper surface and especially on the margin, smooth underneath. Spikes (5) 6-10 cm long, rachis scabrous on main angles; spikelets greenish-purple or purple, subdivergent, 5-7-flowered, 1-1.5 (1.7) cm long (excluding awns); glumes small, 2/5-1/2 the length of lowest floret, 0.35-0.6 cm long, oval-lanceolate, abruptly narrowed, sometimes dentate at the apex, with an awn-point 0.5 mm long, smooth, 5-6-nerved; lemmas 0.8-0.85 cm long, prolonged into a scabrous awn 1-1.6 cm long; palea nearly the length of lemma, 0.7-0.8 cm long, ciliate on the keels, slightly emarginate; anthers 4.5 mm long. June-July.

Stony mountain slopes. -East, Siberia: Ang.-Sayan. Gen. Distr.: Mong. Described from the valley or river Ul'kha (Mongolia). Type in Leningrad.

8. *A. Gmelinii* Schrad. in Linnaea XII (1838) 467. -*Triticum Gmelini* Trin. in Linnaea, l.c. -*Triticum aegilopoides* Turcz. in herb. -*Agropyrum aegilopoides* Drob. Trav. Mus. Bot. Ac. Sc. Petrogr. XII (1914) 46, pro parte.

Perennial. A glaucous-green, tufted plant, with short rhizomes; culms erect or slightly geniculate at the base, (30) 40-50 cm tall; leaves involute, stiff short, basal leaves glabrous, smooth underneath, scaberulous on the upper surface, culm-leaves commonly short-pubescent on the upper surface. Spikes (6) 7-14 cm long, erect, rachis very scabrous on the angles; spikelets glaucous-green, 5-6-flowered, (1.4) 1.6-1.7 (1.8) cm long, 0.25-0.4 (0.5) cm broad; lower spikelets (0.7) 0.9-1.6 (2) cm apart, upper

spikelets 0.7-1.2(1.4) cm apart; glumes small, 2/5-1/2-as long as the lowest floret, (0.4) 0.5-0.8 (0.9) cm long, somewhat unequal, subacute, sometimes asymmetrical and 1-toothed at the summit, smooth; lemmas 5-nerved, 0.9-1.1 cm long, awn (1.3-1.5) 1.6-2 (2.1) cm long, scabrous, covered with numerous short bristles; palea nearly as long as the lemma, subobtusate or very slightly emarginate, ciliate on the keels. June-July.

Gravelly slopes. -East. Siberia: Ang. -Sayan. Endemic. Described from the surroundings of Selenginsk (?). Type in Leningrad.

9. *A. jacutorum* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 502. -*A. aegilopoides* Drob. Trav. Mus. Bot. Ac. Sc. Petrogr. XII (1914) 46, pro parte.

- 636 Perennial. A glaucous-green, pruinose plant; culms 60-85 cm tall; leaves flat or nearly so, 0.2-0.4 cm broad, hairy on the upper surface, smooth underneath. Spikes (5) 6-11.5 (13.5) cm long, rachis slender, scabrous on the angles; spikelets glaucous-green or slightly purple-tinged, 4-5-(6)-flowered, (1.1) 1.2-1.6 (1.7) cm long, 0.2-0.4 (0.5) cm broad; lower spikelets (1) 1.5-1.7 (2) cm apart, upper spikelets (0.8) 0.9-1.3(1.5) cm long; glumes 1/2 the length of lowest floret, 0.4-0.7 cm long, lanceolate, sub-obtusate or subacute, 5-6-nerved, smooth, sometimes asymmetrical and obscurely toothed at the summit, lemmas lanceolate, 5-nerved, 0.9-1 cm long; awn 1.1-1.8 (2) cm long, scabrous owing to small bristles, often tinged; palea as long as the lemma, slightly emarginate, ciliate on the keels. July.

Stony slopes in river valleys. -East. Siberia: Len.-Kol. Endemic. Described from the vicinity of the village Amginskoe (Yakut. reg.). Type in Leningrad.

10. *A. amgunense* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 505.

Perennial. Culms 55-80 cm tall; leaves 0.25-0.4 cm broad, flat, with inrolled margins, hairy or scabrous on the upper surface, smooth underneath, green or glaucous-green. Spikes 8-11 cm long, rachis scabrous on main angles; spikelets (1.4) 1.6-1.8 (2) cm long (excluding awns), 5-7-flowered, glaucous-green, pale, dull, subdivergent; glumes rather narrow, linear-lanceolate, usually considerably exceeding half the length of the lowest floret, sometimes as long as the floret, (0.6) 0.7-1 cm long, gradually tapering to a small point, 5-6-nerved; lemmas 0.9-1 cm long, awn (1.4) 1.6-2.5 (3) cm long, scabrous; palea equaling the lemma, 0.9-1 cm long; anthers 6.5 mm long. June-July.

Stony slopes. -Far East: Ud., Ze.-Bur. Endemic. Described from the borders of Chugchagirskoe Lake. Type in Leningrad.

Series 2. *Divaricatae* Nevski. -Awn usually slightly devaricate at an obtuse angle.

11. *A. attenuatiglume* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934). -*Agropyrum divaricatum* Grossh. in Monit. Jard. Bot. Tifl. 46-47 (1919) 42., non Boiss, et Bal.

- Perennial. A tufted plant, with short, creeping rhizomes; culms 35-70 cm tall, glabrous, smooth; leaves glaucous-green, involute or rather flat, 1.5-4 mm broad, with inrolled margins, very short-pubescent on the upper surface, smooth underneath. Spikes (5) 7-10 cm long, rather dense, green, rachis ciliate on main angles; spikelets subdivergent or appressed, 1-1.4 cm long (excluding awns), 3-4-flowered; glumes lanceolate, 5-7-nerved, 0.8-1 cm long (excluding awns), gradually tapering to a scabrous
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awn 2.5-6 mm long, occasionally toothed at the base of awn, scabrous on the mid-nerve (excurrent into the awn), as long as the lowest floret; lemmas lanceolate, smooth, 0.8-0.9 cm long (excluding awn), prolonged into a scabrous awn; awn slightly divaricate in anthesis, more strongly divaricate at an obtuse angle in maturity, 0.9-2 cm long; palea linear-lanceolate, subobtusate, ciliate on the keels, 0.7 cm long; anthers considerably exceeding half the length of the lowest floret, 5.5 mm long. June-July.

Dry stony slopes. -Caucasus: Talysh. Endemic. Described from Svant. Type in Leningrad.

NOTE. *A. divaricatum* Boiss. et Bal. from Asia Minor belongs apparently to the same series.

Section 3. *Holopyron* (Homb.) Nevski. -Lemmas awnless or with a short, straight awn, glabrous, more rarely hairy. Glumes glabrous, smooth, more rarely ciliate or hairy, devoid of broad hyaline margins. Plants producing creeping rhizomes, or tufted but occasionally rhizomatous.

Series 1. *Stipifoliae* Nevski. -Glumes lanceolate, (3)-5-7-nerved, rounded-subobtusate to subacute more rarely obtuse, smooth (very rarely scabrous on one of the nerves). Lemmas awnless, more rarely short-awned, glabrous. Rachis grooved on the side facing the spikelets. Densely tufted plants, growing on stony slopes and rocks.

12. *A. stipaeifolium* Czern. in Consp. P. Charcov. (1895) 70, nomen nudum.

Perennial. Culms 60-90 (100) cm tall, glabrous and smooth throughout their length, enveloped at the base by blackish-brown old sheaths; leaf sheaths glabrous (only the lowest sheaths occasionally rather hairy), ciliate on the margin, especially in lower part; leaves glaucous-green, involute or flat with inrolled margins, in the latter case 2-2.5 (4.5) mm broad, glabrous and scaberrulous on the upper surface, glabrous and usually smooth underneath, the margins slightly thickened and very scabrous owing to a row of short bristles. Spikes 7.5-12 (17.5) cm long, slender, loose, rachis very scabrous on the two main angles; lower internodes of the rachis 1-2 cm long; spikelets green, 4-flowered, appressed, 1.3-1.7 cm long; glumes lanceolate, subacute, shorter than the lowest floret, to 2-2.2 mm broad, unequal, the lower 0.7-0.85 (0.9) cm long, the upper 0.9-1.1 cm long, both 5-6-nerved, smooth; lemmas lanceolate, subobtusate, 1-1.1 cm long, 5-nerved, the marginal nerves convergent, but not confluent, with the mid-nerve, the intermediate nerves connivent with mid-nerve 1-1.5 mm
638 below the apex; palea lanceolate or broadly lanceolate, as long as the lemma, obtuse or subobtusate, distinctly notched; anthers 6 mm long. June-July.

Stony steppe slopes. -European part: Volg.-Don. Endemic. Described from Sukhoi Yar, near Khar'kov. Type in Khar'kov.

13. *A. scythicum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, 2 (1934).

Perennial. Culms 45-70 cm tall, fairly stout, glabrous, smooth; leaf sheaths glabrous (only the lower sheaths occasionally with sparse hairs), with more or less ciliate margins. Leaves glaucous-green, involute or flat, to 2.5-4 mm broad, with inrolled margins, short-pubescent on the upper surface, scaberrulous on the margin owing to bristles which are smaller than in *A. stipaeifolium*. Spikes slender, loose, 9.5-15 cm

long, rachis scabrous on the two main angles; the lower internodes of the rachis 1-1.4 cm long; spikelets glaucous-green, 1.2-1.7 cm long, 4-5-flowered, subdivergent, glumes lanceolate, rounded obtuse to subacute, shorter than the lowest floret, to 1.8-2 mm broad, unequal, the lower (0.5) 0.6-0.8 cm long, the upper 0.7-1 cm long, both 5-6-nerved, smooth; lemmas 0.9-1 cm long, lanceolate, obtuse, 5-(7)-nerved; marginal nerves convergent toward mid-nerve at the apex, but not confluent, intermediate nerves connivent with mid-nerve just below the apex; palea as long as the lemma, lanceolate, subacute, almost imperceptibly emarginate, ciliate on the keels in upper part; anthers 5-6 mm long. June-July.

Stony slopes. -European part; Crimea. Endemic. Described from Mount Chatyr-Dag (near Alushta). Type in Leningrad.

14. *A. gracillimum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. Culms 50-65 cm tall, slender, glabrous or sometimes pubescent below the nodes; leaf sheaths glabrous (more rarely the lower ones puberulent), smooth, not ciliate on the margin; leaves glaucous-green, 0.5-0.15 cm broad, involute, basal leaves filiform, hairy on the upper side, glabrous, more rarely puberulent, underneath. Spikes loose, slender, 6.5-16 (18) cm long, rachis very scabrous on the two main angles; spikelets glaucous-green, subdivergent or appressed, 1.2-1.6 (1.7) cm long, 4-7-flowered; lower spikelets 1.3-2 (2.2) cm apart; glumes lanceolate, subacute to rounded-obtuse, shorter than the lowest floret, unequal, the lower 0.6-0.8 (0.9) cm long, the upper (0.75) 0.8-1 (1.2) cm long, to 1.6-1.8 mm broad, both 5-6-nerved, smooth; lemmas lanceolate, subobtuse to subacute, 0.8-1.1 cm long, 5-nerved; marginal nerves connivent or subconnivent with mid-nerve at the apex, intermediate nerves confluent with mid-nerve 1 mm (or slightly less) below the apex; palea slightly shorter than or as long as the lemma, lanceolate, rounded-subobtuse or slightly emarginate, ciliate on the keels in upper part; anthers 5.5-6 mm long. July.

Stony slopes. -Caucasus: Ciscauc., Dag., East. Transcauc. Endemic. Described from Dagestan. Type in Leningrad.

15. *A. angulare* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. Culms 40-80 cm tall, glabrous, slender; sheaths of lower leaves puberulent, ciliate on the margin; leaves glaucous-green, very narrow, setaceous-involute, more rarely flat (to 1.5-2 mm broad) with inrolled margins, hairy on the upper surface. Spikes 8-13 (16.5) cm long, rachis scabrous on the two main angles; lower internodes of the rachis 0.8-1.6 cm long; spikelets glaucous-green, loosely 5-6-flowered, 1-1.5 cm long; glumes oblong, only slightly attenuate from the base, obtuse, shorter than the lowest floret, markedly unequal, the lower 0.4-0.6 cm long, the upper 0.6-0.8 cm long, usually divergent at an acute angle, both 5-nerved, smooth; lemmas 0.8-0.9 cm long, oblong-lanceolate, obtuse or subobtuse, 5-nerved, marginal nerves not confluent with mid-nerve at the apex, intermediate nerves connivent or subconnivent with mid-nerve 0.5-1 mm below the apex; palea nearly as long as the lemma, subobtuse, ciliate on the margin only in upper part. June-July.

Caucasus: East. Transcauc. Endemic. -Described from the surroundings of Borzhom. Type in Leningrad.

16. *A. sinuatum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Perennial. A glaucous-green pruinose plant; culms 35-65 cm tall, finely hairy at the nodes; sheaths with long-ciliate margins, the lower ones short-pubescent; leaves flat, to 2-2.5 mm broad, with inrolled margins or involute, densely hairy on the upper surface, the lower ones short-pubescent on the undersurface. Spikes very slender, loose, 15-20 cm long, rachis scabrous on the two main angles, lower internodes of the rachis 1.3-1.6 cm long; spikelets appressed, glaucous-green, 5-6-flowered, 1.2-1.5 cm long; glumes oblong, practically not attenuate, shorter than the lowest floret, markedly unequal, the lower 0.45-0.6 cm long, the upper 0.6-0.7 cm long, both obtuse, smooth, the 5 nerves not connivent at the apex; lemmas 0.75-0.85 cm long, oblong-lanceolate, obtuse or, more often, with a small notch at the summit, 5-nerved, marginal nerves not connivent with mid-nerve, palea as long as the lemma, obtuse, ciliate on the keels only in upper part. June. (Plate XLVII, Figure 4).

Stony mounds. -Caucasus: West. Transcauc. Gen. Distr.: Armenia-Kurdistan. -Described from surroundings of Ardanuch (Artvin distr.). Type in Leningrad.

- 640 17. *A. pertenuis* (C.A.M.) Nevski comb. nova. -*Triticum intermedium* var. *pertenuis* C.A.M. Enum. pl. (1831) 25. -*Agropyrum Tauri* Boiss. et Bal. in Boiss. Fl. Or. V (1884) 666, pro parte.

Perennial. Culms 45-47 cm tall, very slender, numerous, very short-pubescent and scaberulous below the nodes near the base, smooth above; sheaths not ciliate on the margin; leaves glaucous-green, involute, more rarely subplane with inrolled margins, to 1-1.5 mm broad, hairy on the upper surface. Spikes very slender and narrow, loose, (5.5) 6-12 cm long, rachis scabrous on the two main angles, lower internodes of the rachis (0.8) 1-1.3 cm long; spikelets green or somewhat greenish-purple, small, appressed or subdivergent, narrow, 4-5-flowered, 0.9-1.4 (1.5) cm long; glumes lanceolate, subacute to subobtuse, small, 1/2-2/3 as long as the lowest floret, the lower (0.3) 0.4-0.5 (0.55) cm long, the upper 0.5-0.7 cm long, both 5-6-nerved, narrowly scarious-margined; lemmas narrowly lanceolate, subacute, 0.7-0.9 cm long, 5-nerved, intermediate nerves connivent with mid-nerve slightly lower than the marginal nerves; palea as long as the lemma, linear-lanceolate, almost imperceptibly emarginate, ciliate on the keels down to the base. July.

Stony, rocky slopes. -Caucasus: Tal. Gen. Distr.: Arm.-Kurd. Described from Persia. Type in Leningrad.

18. *A. armenum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934). -*Agropyrum caespitosum* Grossh. in herb., pro parte, non C. Koch.

Perennial. Culms 40-55 cm tall, slender, glabrous and smooth all the way up; margins of sheaths not ciliate; leaves glaucous-green, to 2 mm broad, setaceous-involute, rarely subinvolute, hairy on the upper surface. Spikes slender, loose, 4.5-8 (14) cm long, rachis scabrous on the two main angles, lower internodes of the rachis 0.8-1.3 cm long; spikelets not appressed, subdivergent, glaucous-green, faintly tinged with purple, small, (0.8) 0.85-1.1 cm long, 3-4-flowered; glumes lanceolate, acuminate, subacute, about as long as the lowest floret or slightly shorter, the lower glumes (0.5) 0.6-0.7 cm long, the upper glume 0.7-0.8 cm long, both 5-6-nerved, smooth; lemmas narrowly lanceolate, subobtuse to subacute, 0.8-0.85 cm long, 5-nerved, the marginal nerves convergent at the summit

but not connivent with mid-nerve, intermediate nerves connivent with mid-nerve slightly lower down; palea as long as or very slightly longer than the lemma, subobtusely, obscurely short-ciliate on the keels in upper 2/3. July.

Stony slopes. -Caucasus: South. Transcauc. -Endemic. Described from the southern slope of Bezdobdai'skii Range. Type in Tiflis.

19. *A. pruiniferum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

- 641 Perennial. A glaucous-green, pruinose plant; culms 30-70 cm tall, fairly stout at the base, smooth, glabrous or short-pubescent below the nodes; sheaths smooth, glabrous on the margin; leaves involute, stiff, very narrow, minutely pubescent on the upper surface, smooth underneath; numerous sterile shoots at the base of culms, with spreading, setaceous-involute leaves. Spikes 6-12 (15) cm long, rather loose, rachis scabrous on the two main angles, lower internodes of the rachis 0.8-1.2 cm long; spikelets glaucous-green, 1.1-1.4 (1.5) cm long, 3-5-flowered; glumes lanceolate, acute to subacute, shorter than the lowest floret, the lower glume (0.4) 0.5-0.6 (0.7) cm long, the upper 0.6-0.7 (0.8) cm long, to 1.5 mm broad, both 5-6-nerved, smooth, scarious-margined; lemmas lanceolate, 0.8-0.85 cm long, acuminate, 5-nerved, both pairs of lateral nerves connivent with mid-nerve at the same level, more rarely the intermediate nerves confluent with mid-nerve slightly lower down; palea linear-lanceolate, faintly emarginate, ciliate on the keels in upper part (cilia fairly long), as long as the lemma; anthers 5-5.2 mm long. July.

Rocks and gravelly slopes. -European part: Volg. -Kam. (South. Ural), Volg. -Don., (Zheguli); West. Siberia: Upp. Tob. (Mugodzhary). Endemic. Described from Mount Turatka (Zilair Kant.). Type in Leningrad.

20. *A. dshungaricum* Nebski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 3 (1934).

Perennial. A glaucous-green plant, not pruinose; culms 50-85 cm tall, rather stout below, smooth all the way up; sheaths glabrous, smooth, the margins not ciliate; leaves glaucous-green, 1-2.5 mm broad, flat, with inrolled margins or involute, hairy on the upper surface, smooth underneath. Spikes narrow, 7-14 cm long, loose, rachis almost entirely smooth, scaberulous only on the two main angles in the upper part of internodes, lower internodes 1-1.8 (2) cm long; spikelets glaucous-green, sometimes slightly tinged, rather small, 1-1.5 cm long, subappressed, (3)-4-6-flowered; glumes lanceolate, rounded-obtusely to subacute, the lower (0.4) 0.5-0.7 cm long, the upper (0.55)-0.6-0.8 cm long, to 1.5-1.7 mm broad, shorter than the lowest floret, both 5-nerved, one of the nerves sometimes faintly scabrous; lemmas 0.8-0.9 cm long, subacute, 5-nerved, the intermediate nerves connivent with mid-nerve slightly lower than the marginal nerves; palea as long as the lemma or nearly so, subobtusely, short-ciliate on the keels in upper part; anthers 5 mm long. June.

Stony slopes. -Centr. Asia: Dzung. -Tarb., Tyan'-Shan. Endemic. Described from eastern Tyan'-Shan. Type in Leningrad.

21. *A. ferganense* Drob. in Trav. Mus. Bot. Acad. Sc. Petrogr. XVI (1916) 138.

- 642 Perennial. A glaucous-green plant; culms glabrous and smooth all the way up, 50-90 cm tall; sheaths of the lowest leaves very short-pubescent; margins of sheaths glabrous; leaves involute or flat (to 4 mm broad), with inrolled margins, scabrous and glabrous, more rarely hairy, on the upper

surface, glabrous underneath and occasionally scabrous in upper part. Spikes loose, 9-15 (19) cm long, rachis very scabrous on the two main angles, lower internodes of the rachis 1.5-2.5 (3-3.2) cm long; spikelets green or slightly tinged, 5-7-(8)-flowered, (1.3) 1.5-2 cm long; glumes lanceolate, subacute, the lower glume (0.6) 0.7-0.9 (0.95) cm long, the upper glume (0.75-0.8) 0.9-1.1 cm long, to 2.2-2.4 mm broad, both 5-6-nerved, smooth, or one of the nerves faintly scabrous; lemmas broadly lanceolate, 0.9-1.1 cm long, obtusely pointed, 5-nerved, intermediate nerves connivent with mid-nerve at the very apex; palea lanceolate, as long as the lemma, subobtuse or slightly emarginate, ciliate on the margin; anthers 6-7 mm long. June.

Gravelly slopes. -Centr. Asia: Pam. -Al. Endemic. Described from the mountainous part of Fergana. Type in Leningrad.

22. *A. setuliferum* Nevski in Acta Inst. Bot. Acad. URSS, ser. I, 2 (1934).

Perennial. Culms 50-80 cm tall, very scabrous in upper part below the spikes; leaves flat, with inrolled margins or subsetaceous-involute, to 3 mm broad, short-pilose on the upper surface, very scabrous underneath over the whole surface or only on marginal veins, slightly or markedly glaucous-green; leaves of sterile shoots long, setaceous-involute. Spikes slender, loose, 5-12 cm long, rachis densely setulose with small bristles, very rough; spikelets green or faintly tinged, shorter than the rachis internodes, more rarely same length, (0.8) 1-1.5 (1.8) cm long (the lower internodes (1) 1.2-1.9 (2) cm long), (3)-5-6-flowered; glumes lanceolate, obtuse to subacute, shorter than the lowest floret, (5) 0.55-0.8 cm long, to 2.2 mm broad, narrowly scarious-margined, 5-7-nerved, slightly unequal, scaberulous on the nerves or more often on one of the nerves only; lemmas lanceolate, smooth, 0.8-0.9 cm long, obtuse or subobtuse, the midnerve scarcely excurrent; marginal nerves reaching the apex, not connivent or scarcely connivent with mid-nerve, intermediate nerves connivent (or nearly so) with mid-nerve just below the apex; palea as long as the lemma or very slightly longer; anthers 5 mm long. June-July.

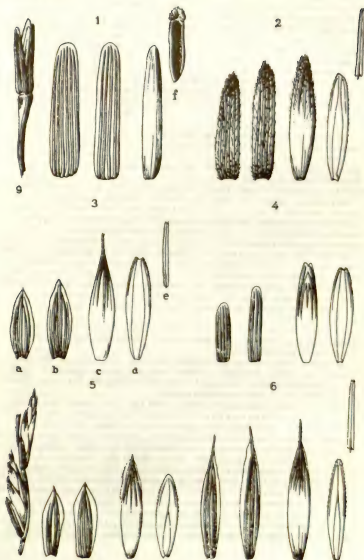
645 Mountain slopes in the juniper zone. -Centr. Asia: Pam. -Al. Endemic. Described from Kugitang mountains. Type in Leningrad.

23. *A. geniculatum* (Trin.) Korsh. Tent. Fl. Ross. orient. (1898) 488 (quoad nomen). -*Triticum geniculatum* Trin. in Ldb. Fl. altaica I (1829) 117. -Lc.: Ldb. Ic. pl. Fl. Ross. III tab. 247.

Explanation to Plate XLVII

1. *Agropyrum junceum* (L.) P. B. -2. *A. trichophorum* (Link) Richt. -3. *A. geniculatum* (Trin.) Korsh. -4. *A. sinuatum* Nevski. -5. *A. lololoides* (Kar. et Kir.) Roshev. -6. *A. repens* (L.) P. B.

In all instances, "a" and "b" lower and upper glume respectively, "c" lemma, "d" palea, "e" anthers, "f" caryopsis, and "g" portion of spike.



Perennial. Culms geniculate at the base, (20) 30-70 cm tall, glabrous, smooth; leaves glaucous-green, narrowly linear, setaceous-involute, glabrous, very scabrous on the margin. Spikes erect, 6.5-12 cm long, loose, rachis scabrous on main angles, lower internodes of the rachis 0.8-1.6 (2) cm long; spikelets glaucous-green, sometimes faintly purple-tinged, 1.5-1.8 cm long, 5-7-flowered; rachilla and callus glabrous; glumes lanceolate, shorter than the lowest floret, unequal, the lower 0.5-0.7 cm long, the upper 0.6-0.9 cm long, both tapering to a small point, 5-7-nerved, smooth; lemmas broadly lanceolate, smooth, 5-nerved above, 0.8-1 cm long, tapering to a straight or obscurely divergent awn 0.5-2 mm long, rarely 0.5-0.8 cm long (f. *aristatum* Nevski); palea 0.8-0.9 cm long, slightly emarginate, ciliate on the keels; anthers 4-5 mm long. June. (Plate XLVII, Figure 3).

Stony slopes and rocks. -West. Siberia: Alt.; East. Siberia: Ang. - Sayan. -Described from the river Charysh. Type in Leningrad.

Series 2. *Pallidae* Nevski. -Glumes narrow, linear-lanceolate, 3-nerved, subulate-tipped, smooth. Lemmas subulate-tipped to a point 0.5-1 mm long, glabrous.

24. *A. Sosnovskyi* Hack., *Monit. Jard. Bot. Tifl.* XXIX (1913) 26.

Perennial. Culms 35-50 cm tall, slender, smooth; leaves glaucous-green, narrowly linear, (1) 1.5-2 mm broad, flat, with inrolled margins, minutely pubescent on the upper surface, smooth underneath. Spikes slender, loose, 12-15 cm long, rachis scabrous on main angles, lower internodes of the rachis 1.5-1.7 cm long; spikelets glaucous-green, pale, 3-4-(5)-flowered, 1-1.6 cm long; glumes narrow, linear-lanceolate, subulate-tipped, 0.6-0.9 cm long, shorter than the lowest floret, slightly unequal, smooth, 3-nerved, the lateral nerves less distinct; lemmas 0.8-0.9 cm long, linear-lanceolate or lanceolate, 5-nerved, subulate-tipped to a small point to 0.5-1 mm long; palea nearly as long as the lemma, subacute, very slightly emarginate, bidentate, ciliate on the keels; anthers 4 mm long. June.

Dry stony hills and slopes. -Caucasus: possibly occurring in southern Transcaucasia. Gen. Distr.: Arm. -Kurd. Described from the Ol'ta district. Type in Tiflis.

646 Series 3. *Caespitosae* Nevski. -Glumes oblong-linear, obtusely truncate or obtuse, smooth. Lemmas awnless, obtuse, glabrous. Internodes of rachis broad, nearly flat on the side facing the spikelets. Spikelets rather small. Densely tufted plants.

25. *A. firmiculmis* Nevski in *Acta Inst. Bot. Acad. Sc. URSS*, ser. I, 2 (1934). -*Agropyrum firmum* Freyn in herb., non Presl.

Perennial. Culms very firm, glabrous and smooth, 50-70 cm tall; sheaths smooth; leaves setaceous-involute, glaucous-green, very narrow, smooth underneath, hairy or short-pubescent on the upper surface. Spikes erect, (8) 12-18 cm long, narrow; internodes of the rachis broad, nearly flat on the side facing the spikelets, scabrous on the two main angles, the lower internodes (1.3) 1.8-2.2 cm long; spikelets glaucous-green, closely appressed to the rachis, 1.2-1.8 (1.9) cm long, (2) 2.5-3 mm broad, oblong-linear, 3-5-flowered; glumes oblong, obtusely truncate or obtuse, unequal, the lower 0.55-0.6 cm long, the upper 0.7-0.85 cm long, both 5-nerved, entirely smooth; lemmas oblong, obtuse, (0.8) 0.9-0.95 cm long; palea as long as the lemma, obtuse, minutely ciliate on the keels. June.

Caucasus: South. Transcauc. Gen. Distr.: Arm.-Kurd. Described from the vicinity of Ustupa. Type in Leningrad.

26. *A. caespitosum* C. Koch in *Linnaea* XXI (1848) 424. - *A. transcaasicum* Grossh. in herb. - *A. Tauri* var. *glabrum* Grossh. in Not. Syst. Herb. Horti Petropol. IV (1923) 20.

Perennial. Densely tufted; culms glabrous and smooth, 30-55 (65) cm tall; leaves glaucous-green, flat, 2-3 mm broad, with inrolled margins or involute, glabrous, scabrous on the upper surface, usually smooth underneath, very rough on the margin owing to a row of small prickles. Spikes 6-12 (20) cm long; rachis flattened on the side facing the spikelets, strongly hispid on the two main angles; lower internodes of the rachis 1-2 cm long; spikelets glaucous-green, 3-(5)-flowered, 1-1.5 cm long; glumes oblong, obtusely truncate or obtuse, unequal, the lower 0.6-0.8 cm long, the upper 0.7-0.9-(0.95) cm long, 1.5-1.8 mm broad, both 5-nerved, smooth; lemmas lanceolate, obtuse, 0.85-1 cm long, 5-nerved, glabrous, rarely ciliate above on the margins. June.

Stony slopes. -Caucasus: South. and East. Transcauc. Gen. Distr.: Arm.-Kurd. Described from the Ardagan district. Type in Berlin.

27. *A. nodosum* (Stev.) Nevski comb. nova. - *Triticum nodosum* Stev. ex M. B. Fl. taur.-cauc. III (1819) 96. - *T. junceum* L. var. γ M. B., l. c.

- 647 Perennial. Culms few, slender, thickened and very firm at the base, (25) 30-60 (80) cm tall, smooth; leaves involute, very narrow (those of the culm to 1.5-2 mm broad), glaucous-green, scabrous on the upper surface, smooth, glabrous on the lower surface. Spikes (3.5) 4-8 (12) cm long, glaucous-green, internodes of the rachis flattened, scabrous on the margins, the lower ones 0.9-1.5 (2) cm long; spikelets 3-5-flowered, 1-1.2 (1.4) cm long, with subdivaricate florets; glumes oblong, obtuse, unequal, the lower 0.4-0.55 (0.6) cm long, the upper 0.5-0.7 cm long, both 5-6-nerved, smooth; lemmas lanceolate, subobtuse, 0.75-0.85 cm long. June.

Stony and dry slopes. -European part: Crimea. Endemic. Described from Crimea. Type in Leningrad.

Series 4. *Elongatae* Nevski. -Glumes linear-oblong, smooth, obtusely truncate. Internodes of the rachis nearly flat on the side facing the spikelets. Spikes very long (20-30 cm), with remote, large (to 2-2.5 cm long), many-flowered spikelets. A tufted plant.

28. *A. elongatum* (Host) P. B. Agrost. (1812) 102; Shmal'g. Fl. II 658; -*Triticum elongatum* Host, Gram. Austr. II (1802) 18, t. 23. - *Tr. rigidum* Schrad. Fl. Germ. I (1806) 329; Griseb. in Ldb. Fl. Ross. IV 341, partim.

Perennial. Culms erect, stout, very hard, glabrous, (50) 75-100 cm tall, rarely lower; leaves grayish-green or glaucous, involute, stiff, thick-veined, scabrous and glabrous on the upper surface and on the margin, smooth underneath. Spike erect, 10-30 cm long, more rarely shorter, loose; lower internodes of the rachis (1) 1.5-3 cm long, the upper ones shorter, all internodes flat or nearly so on the side facing the spikelets, scabrous on the angles; spikelets appressed before flowering, divaricate in anthesis, large, 1.4-2.5 cm long, 5-9-(11)-flowered; glumes obtuse, subtruncate, oblong, slightly unequal, 0.7-1.1 cm long, to 2.5-3 mm broad, 5-7-(9)-nerved, indurate, smooth, shorter than the lowest floret; lemmas broadly lanceolate, 1-1.2 cm long, obtuse, 5-nerved, the mid-nerve thicker

than the other nerves; palea smooth, slightly shorter than the lemma, 0.9-1 cm long, lanceolate or broadly lanceolate, obtuse, ciliate on the keels. July.

Solonchak steppe-meadow, solonchaks, sea coast. -European part: Prichern., Crimea, Low. Volg., Low. Don.; Caucasus: Ciscauc., West. and East. Transcauc. Gen. Distr.: Balk. -As. Min. Described from places subject to inundation by sea water, near Trieste. Type in Vienna.

ECONOMIC IMPORTANCE. A fairly satisfactory forage plant. It should be tested for cultivation in solonchak meadows.

Series 5. *Junceae* Nevski. -Rachis of spike very brittle, smooth on the ribs. Glumes oblong, obtuse, rather truncate, smooth. Lemma awnless, smooth. Rhizome creeping.

29. *A. junceum* (L.) P. B. Agrost. (1812) 102; Shmal'g. Fl. II 658. -*Triticum junceum* L. Moen. Acad. IV (1759) 266; Griseb. in Ldb. Fl. Ross. IV, 342. -Ic.: Fl. Dan. tab. 916.

Perennial. Rhizome branching, long-creeping; culms (25) 30-60 cm tall, rigid, erect; sheaths glabrous and smooth, the lower ones yellowish-brown; leaves glaucous, prunescent, very long and stiff, involute, 0.8-648 -0.9 cm broad when unrolled, glabrous and smooth on both sides, scabrous on the margin, thick-veined, resembling the leaves of *Elymus arenarius*. Spikes to 20 cm long, with a strongly disarticulating, stout rachis; internodes of the rachis flat on the side facing the spikelets, quite smooth on the angles, the lower internodes 1.5-2.5 cm long; spikelets glaucous-green, (3)-4-8-flowered; glumes oblong, obtuse, subequal, 1.1-1.5 cm long, 5-9-(11)-nerved, smooth; lemmas obtuse, glabrous; palea nearly as long as the lemma, ciliate above on the keels; caryopsis deeply furrowed. June-July. (Plate XLVIII, Figure 1).

Coastal sands, dunes. -European part: Crimea, Prichern. Gen. Distr.: Scand., Atl. Eur., West. and East. Medit., Balk. -As. Min. Described from Switzerland. Type in London.

Series 6. *Trichophorae* Nevski. -Rachis of spike disarticulating, scabrous on the angles. Glumes obtuse (obliquely truncate) or pointed, thick-nerved. Glumes hairy or smooth, awnless. Rhizome creeping.

30. *A. intermedium* (Host) P. B. Agrost. (1812) 146; Shmal'g. Fl. II, 657, pro parte. -*Triticum intermedium* Host, Gram. Austr. II (1805). -*T. glaucum* Desf. Hort. Paris. ed. I (1804) 16, nomen nud. -*Agropyrum glaucum* Roem. et Schult. Syst. II (1817) 752.

Perennial. A glaucous-green plant. Culms 60-100 cm tall, glabrous, smooth; sheaths ciliate on the margin; leaves flat, 3-7 cm broad, sparsely long-pilose, scabrous on the upper surface, smooth underneath or scabrous only in terminal part. Spikes erect, rather loose, 10-20 cm long, rachis scabrous on the two main angles; spikelets 3-5-(6)-flowered, 1-1.6 cm long; glumes oblong or oblong-lanceolate, broad, obtuse, obliquely truncate, slightly unequal, 0.5-0.8 cm long, 2-3 mm broad, shorter than the lowest floret, 5-7-nerved, smooth, glabrous; lemmas broadly lanceolate, 0.8-1 cm long, subobtuse, glabrous; palea nearly as long as the lemma; anthers 5-6.5 mm long. June.

Steppe slopes, exposed limestone. -European part: Mid. Dnep., Prichern., Crimea, Low. Don., Volg. -Don., Upp. Volg., Volg. -Kam. (Kazan'); Caucasus: Ciscauc., East. Transcauc.; Centr. Asia: Upp. Turkm.

Syr-Dar., Pam.-Al. Gen. Distr.; Centr. Eur., Balk.-As. Min. Described from Southern Europe. Type in Vienna.

A. intermedium (Host) P. B. $\times$ *A. repens* (L.) P. B. -Differs from *A. intermedium* in pointed glumes, from *A. repens* in more developed leaf veins and in the shape of glumes which are broader and abruptly narrowed, with thick nerves. -European part: Prichern., Crimea; Caucasus: Ciscauc.

31. *A. trichophorum* (Link)Richt. P. Europ. I (1890) 124. -*Triticum trichophorum* Link in Linnaea XVII (1843) 395. -*T. hirsutum* Stev. ex Schrad. in Linnaea XII (1838) 466, non Hornm. (1819). -*Agropyrum Aucheri* Boiss. Diagn., ser. 1, V (1844) 75. -*A. intermedium* b. *villosum* Schmalh. Fl. II (1897) 657.

- 649 Perennial. Culms 60-100 cm tall, glabrous; sheaths of lower leaves hairy (more rarely glabrous), ciliate on the margin; leaves flat, glaucous-green, (0.2) 0.3-0.7 cm broad, long-pilose and scabrous on the upper surface, very scabrous and occasionally pilose underneath. Spikes rather loose, 10-20 cm long, with a more or less hairy rachis; spikelets hairy, 0.9-1.8 cm long, (3)-4-7-flowered; glumes oblong-lanceolate, obtuse to subacute, obliquely truncate, narrower than in *A. intermedium*, hairy, slightly unequal, 0.5-0.9 cm long, 2-2.5 mm broad, (4)-5-7-nerved; lemmas covered with long white hairs toward the summit and on the margin, glabrous on the back below, (0.7) (0.8-1.2 cm long, subobtusate; palea slightly shorter than the lemma, long-ciliate on the keels; anthers to 8 mm long. June. (Plate XLVII, Figure 2).

Steppe and mountain slopes. -European part: Prichern., Crimea, Low. Don.; Caucasus: Ciscauc., Dag., East. and South. Transcauc., Tal.; Centr. Asia: Upp. Turkm., Pam.-Al., Syr-Dar., Tyan'-Shan. Gen. Distr.; Balk.-As. Min., Arm.-Kurd., Iran. Described from the surroundings of Trieste. Type in Berlin.

ECONOMIC IMPORTANCE. Readily grazed in pasture in spring and early summer by cattle and horses, less readily by camels and sheep. Hay produced by this species is rather coarse, but is willingly accepted by all kinds of livestock. Yields 6-12 centners per hectare. May assume an important position in grass-stands and unirrigated fields of Central Asia.

Series 7. Pulcherrimae Nevski. -Rachis of spike not brittle, scabrous on the ribs. Glumes obtuse (obliquely truncate), sometimes dentate, thick-nerved. Spikelets hairy or smooth, short-awned. Rhizome creeping.

32. *A. pulcherrimum* Grossh. in Monit. Jard. Bot. Tiflis, 46-47 (1919) 42, tab. 4. -*A. Popovii* Drob. in Fedde, Repert. sp. nov. XXI (1925) 44. -*A. ambigens* Roshev. in Fl. Turcom. I (1932) 191. -*A. intermedium* var. *ambigens* Hausskn. ex Halascy, Conspectus Fl. Graec. III (1904) 437.

Perennial. Culms 50-100 cm tall, glabrous; sheaths long-ciliate on the margin, the lower ones hairy; leaves flat, 0.4-0.7 cm broad, rather hairy. Spikes 12-20 cm long; spikelets 5-7-(10)-flowered, 1.5-1.8 cm long (excluding awns); glumes lanceolate, 5-7-nerved, pointed or obliquely truncate, dentate or entire at the summit, 0.8-1 cm long, hairy; lemmas lanceolate, 0.9-1.1 cm long, hirsute above and on the sides, glabrous on the back below, 5-nerved, prolonged into a straight awn 0.5-0.9 (1) cm long; palea nearly as long as the lemma, ciliate on the keels. June-August.

Steppe slopes. -Caucasus: South. Transcauc.; Centr. Asia: Upp. Turkm., Syr-Dar. Gen. Distr.: Arm. -Kurd. Described from the area around the town of Ardagan. Type in Tiflis.

- 650 Series 12. *Ciliolatae* Nevski. -Glumes rounded-obtuse, broadly scabrous-margined, ciliate on the mid-nerve. Lemmas awnless, smooth, more rarely hairy. Rhizome long-creeping.

33. *A. ciliolatum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser I, 2 (1934).

Perennial. Culms 70 cm tall, glabrous; sheaths of lower leaves densely long-hairy (the hairs white, retrorse), those of the upper leaves glabrous; leaves glaucous-green, to 5 mm broad, with inrolled margins, sparsely covered with long white hairs on the upper surface, glabrous and smooth underneath. Spike 12 cm long, rachis scabrous on the angles; spikelets 7-8-flowered, 1.4-1.5 cm long, glaucous-green; glumes very small, 1/2 as long as the lowest floret, (0.3) 0.4-0.45 cm long, lanceolate or oval-lanceolate, obtuse, 5-nerved, with long, white cilia on the mid-nerve, broadly scarious-margined; lemmas 0.75-0.8 cm long, 5-nerved, glabrous, obtuse. June.

Stony meadow-steppes. -West. Siberia: Upp. Tob. Endemic. Described from steppe slopes by the river Sary-elga (Agrayashskii Kant.). Type in Leningrad.

34. *A. pumilum* (Steud.) Nevski comb. nova. -*Triticum pumilum* Steud., Synop. I (1855) 334.

Perennial. Culms 15-24 cm tall; leaves to 3 mm broad, sparsely covered with white hairs above, glabrous and smooth underneath, flat, with inrolled margins. Spikes 3-5.2 cm long, rachis scabrous on the two main ribs; spikelets 5-8, glaucous-green, 5-(6)-flowered, 1-1.1 cm long; glumes lanceolate or oval-lanceolate, obtuse, broadly scarious on the margin, 4-5-nerved, long-ciliate on the midnerve, shorter than the lowest floret, (0.4) 0.5-0.55 (0.6) cm long; lemmas 0.7 cm long, obtuse, glabrous; palea nearly as long as the lemma, 0.65 cm long, ciliate on the keels (the cilia sparse, thick); anthers 4 mm long. June-July.

Sands in river valleys. -East. Siberia: Ang. -Sayan. Endemic. Described from the surroundings of Krasnoyarsk. Cotype in Leningrad.

35. *A. Krylovianum* Schischk. in Animadvers. syst. ex Herb. Univers. Tomsk. 2 (1928); Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II (1928) 353.

Perennial. Loosely tufted, with short, creeping rhizomes; culms 50-90 cm tall, glabrous, scaberulous below the spikes; sheaths of lower leaves covered with long, retrorse hairs; leaves flat, 0.5-0.7 cm broad, with inrolled margins, glabrous (sometimes with sparse long hairs on the upper surface, ciliate on the margin), glabrous underneath, scaberulous on the upper surface. Spikes oblong-linear, fairly dense, 8-12 cm long, 0.7-1.4 cm broad, rachis rather hairy; spikelets slightly divergent, ascending at an acute angle to the rachis, green, 5-9-flowered, 0.8-1.5 cm long; glumes lanceolate, with 2-3 lateral nerves and a more pronounced, ciliate midnerve, pointed, 0.4-0.8 cm long; lemmas lanceolate, 0.7-0.9 cm long, terminating in an awn-point 0.5-1 mm long; palea nearly as long as the lemma, pointed, ciliate on the keels; anthers 4 mm long. June-July.

- 651 Grassy slopes. -West. Siberia: Alt. Described from the valley of river Chuya. Type in Tomsk.

Series 8. *Lolioideae* Nevski. - Glumes rounded-obtuse, scarious-margined, glabrous. Lemmas subobtusate, glabrous. Rhizome long-creeping.

36. *A. lolioides* (Kar. et Kir.) Roshev. Consp. Gram. Turkest. (1923) 88. - *Triticum lolioides* Kar. et Kir. in Bull. Soc. Nat. Mosc. (1841) 866; Griseb. in Ldb. Fl. Ross. IV, 343. - *Agropyrum intermedium* var. *angustifolium* Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II (1928) 354.

Perennial. A glaucous-green plant; culms 30-75 cm tall; sheaths glabrous and smooth; leaves involute, narrow, to 2-4 mm broad, more rarely flat, to 5-6 mm broad, with inrolled margins, very short-pubescent or sparsely covered with white hairs on the upper surface, glabrous and smooth underneath. Spikes erect, 7-14 cm long, rachis scabrous on the two main angles; spikelets appressed or subdivergent, (3)-5-8-flowered, (1) 1.1-1.5 (1.7) cm long, glaucous-green, shorter than the lowest floret, (0.4) 0.5-0.7 cm long, 5-7-nerved; lemmas lanceolate, 0.8-0.85 cm long, subobtusate, scarious above, 5-nerved, the mid-nerve slightly excurrent into a very short, thickish point slightly projecting beyond the apex; palea nearly as long as the lemma, ciliate on the keels (cilia rather long and thick). June-July. (Plate XLVII, Figure 5).

Steppe slopes, sands. - European part: Volg. - Kam., Zavolzh., Volg. - Don.; West. Siberia: Alt., Irt., Upp. Tob.; East. Siberia: Ang. - Sayan. Endemic. Described from the surrounding of Semipalatinsk. Type in Leningrad.

37. *A. elongatiforme* Drob. in Fedde, Repert. sp. nov. XXI (1925) 44.

Perennial. A glaucous-green plant; leaves scabrous, with short bristles on the upper surface, rather scabrous also on the lower surface, flat, 0.4-0.7 cm broad; sheaths smooth; culms geniculate at the base. Spikes erect, (6) 9-13 cm long; spikelets somewhat spreading, often contorted, 5-9-flowered, 1.1-1.5 cm long; glumes (10.4) 0.5-0.6 cm long, 5-7-nerved, scarious-margined, lanceolate, subobtusate, smooth; lemmas 0.7 cm long, scarious-margined above, subobtusate, the mid-nerve prolonged into a very short, thickish, rather blunt point not projecting beyond the apex; palea slightly shorter than the lemma, with very short cilia above on the keels. June.

Meadows, borders of canals. - Caucasus: Transcauc.; Centr. Asia: Syr-Dar., Pam. - Al., Upp. Turkm. Endemic. Described from the surroundings of Tashkent. Type in Tashkent.

652 Series 9. *Repentes* Nevski. - Glumes tapering into a very short awn-point, glabrous. Lemmas glabrous, short-awned or awnless. Rhizome long-creeping. Meadow plants or weeds.

38. *A. repens* (L.) P. B. Agrost. (1812) 102; Shaml'g. Fl. II, 657; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 351, partim. - *Triticum repens* L. Sp. pl. (1753) 86; Griseb. in Ldb. Fl. Ross. IV, 340, pro parte. - *Elytrigia repens* Desv. in Nuov. Bull. Soc. philom. II (1810) 191. - Ic.: Fl. Dan. tab. 748; Rehd. Ic. Fl. Germ. I, tab. 20, fig. 1384-1388.

Perennial. Rhizome long, creeping, branching; culms few, smooth; sheaths glabrous and smooth, or sometimes the lower ones hairy; leaves flat, (3) 5-10 mm broad, thin-veined, very scabrous, glabrous (rarely

with spreading hairs on the veins) on the upper surface, smooth or rather scabrous in upper part underneath, green or glaucous-green. Spikes erect, 7-15 cm long, rachis ciliate on the angles, more rarely pubescent over its whole length; spikelets somewhat divergent, green, glaucous-green, or rather purple-tinged, 1-1.7 (2) cm long, (4)-5-7-flowered; glumes lanceolate, terminating in an awn-point or acute (occasionally short-awned), 0.7-1.2 cm long, 5-7-nerved, smooth, glabrous, scabrous only near the summit on the mid-nerve owing to numerous spinose bristles; lemma lanceolate, glabrous, 0.7-1.1 cm long, awned (awn 2-6 mm long), subulate-tipped or subobtuse (in strains from the Black Sea area and Turkestan); palea slightly shorter than the lemma, ciliate on the keels; anthers 5-5.5 mm long, exceeding half the length of the palea. June-July (August-September). (Plate XLVII, Figure 6).

Meadows, fallows, and arable fields. -All over the U. S. S. R., but apparently introduced in the Far East and Kamchatka. Gen. Distr.: Europe, Asia Minor, Iran, Dzung. -Kashg., Mong.; introduced in America. Described from Europe. Type in London.

ECONOMIC IMPORTANCE. As a weed quack grass is mainly represented by its awned form (a troublesome weed in the forest-steppe and forest zones). While being a troublesome weed, *Agropyrum repens* is, nevertheless, a most valuable forage grass. In the south of the U. S. S. R., flood meadows with a sward of quack grass are the most valued hay lands, yielding up to 5-6 tons of hay per hectare. Quack grass bearing fallows, widely occurring in Kazakhstan, Southern Ural, and Western Siberia, are also used for hay cutting. As quack grass does not endure excessive soil compaction, spring and fall disking is necessary to encourage it on fallow land and in cultivation. The period of exploitation of quack grass can thus be prolonged to 10 or even 15 years.

- 653 *Agropyrum repens* (L.) P. B. × *Elymus arenarius* L. - A sterile hybrid. Spikelets in the middle part of the spike arranged in twos, above and below usually solitary, rarely the entire spike bearing solitary spikelets. Rhizomes and culms resemble those of *E. arenarius*. Spikelets smaller, glaucous or purple-tinged; lemmas covered with fine hairs. -Arctic: Arctic Eur.; European part: Kar. -Lap., Dv. -Pech.

Agropyrum repens (L.) P. B. × *Aneurolepidium dasystachys* (Trin.) Nevski. -*Agropyron wiluicum* Drob. in Trav. Mus. Bot. Acad. Sc. Petrogr. XVI (1916) 96. -Rhizome long-creeping, branching. The lower marcescent sheaths more or less split into individual fibers (as in the case of *Aneurolepidium dasystachys*). Culms and leaves glaucous. Spikelets solitary. Glumes faintly keeled, with almost imperceptible lateral nerves, ciliate on the keel. Lemmas hairy on the back. -East, Siberia: Len. -Kol.

Subgenus 2. EU-AGROPYRUM Nevski - *Agropyron* Gaertn. in Nov. Comm. Acad. Petrop. XIV (1770) 539 s. str.

Spikes linear or ovoid, with short rachis internodes, spikelets solitary, subhorizontally spreading or ascending or at an acute angle. Spikelets sessile, 3-10-flowered, laterally compressed, awnless or short-awned. Glumes laterally compressed, scaphoid, keeled, with pronounced mid-nerve (keel) and obsolete lateral nerves, thinly scarious-margined, smooth, or ciliate on the keel. Lemma scaphoid, short-awned or awnless. Palea bidentate, ciliate on the margin. Anthers long, slightly shorter than the

palea. Caryopsis oblong, hairy on the top, furrowed. Perennials with creeping rhizomes, or densely tufted without rhizomes.

ECONOMIC IMPORTANCE. Species of this subgenus, especially three of them: *Agropyrum cristatum* auct. pro parte = *A. pectiniforme*, *A. desertorum*, and *A. sibiricum*, should be capable of solving the problem of extending forage grasses into the arid regions of the Soviet Union. They are distinguished by high quality (nutritive value and palatability), they are drought- and salt-resistant, and they give high yields of hay (on the average 1-2 tons per hectare). Moreover, as opposed to species of the subgenus *Elytrigia*, they yield a large quantity of seed amenable to harvesting and to thrashing; the seeds germinate well and give rise to uniform seedlings. The plants are readily eaten by all kinds of livestock up to the heading stage, but not so later on. The fall after-growth is satisfactorily grazed. Nutritive value slightly below that of *Elytrigia* species.

1. Plants with long-creeping, branching rhizomes 2.
- + Plants tufted, more rarely with short creeping rhizomes 5.
2. Spikes broadly linear, (0.8) 1-2 cm broad 3.
- + Spikes linear, 0.5-0.7 cm broad, faintly comb-like 40. *A. tanaiticum* Nevski.
- 654 3. Spikes rather loose, the lower internodes of the rachis 0.6-1.2 cm long. Lemmas awnless 39. *A. dasyanthum* Ldb.
- + Spikes dense, the lower internodes of the rachis only 0.2-0.5 cm long. Lemmas awn-pointed, 1-2 mm long 4.
4. Spikes 2-sided, comb-like; spikelets spreading, pressed against each other; glumes glabrous 41. *A. cimmericum* Nevski.
- + Spikes faintly comb-like; spikelets imbricate; glumes usually ciliate on the keel 42. *A. Michnoi* Roshev.
5. Spikes linear, 6-15 cm long. Lemmas pointed, awnless or terminating in a short awn-point not exceeding 1 mm 6.
- + Spikes short-linear, oblong-ovaloid or ovoid, 1.3-5.5 (7) cm long. Lemmas with awn (1) 2-4 mm long 7.
6. Leaf sheaths and blades glabrous, smooth or scaberulous 44. *A. sibiricum* (Willd.) P. B.
- + Leaf sheaths and blades on both sides velutinous 43. *A. fragile* (Roth) Nevski.
7. Spikes not crested, with imbricate spikelets, subcylindrical 8.
- + Spikes crested, the spreading spikelets parallel to each other 10.
8. Culms thickened at the base. Spikes 1.5-3 cm long 9.
- + Culms not thickened at the base. Spikes 2.5-7 cm long 45. *A. desertorum* (Fisch.) Roem. et Schult.
9. Sheaths smooth. Leaves glabrous, smooth underneath, scabrous on the upper surface 46. *A. badamense* Drob.
- + Sheaths hairy, with ciliate margins. Leaves ciliate on the margin 47. *A. ponticum* Nevski.
10. Culms 12-25 cm tall; sterile shoots surrounding the culms of the base 3-4 cm tall, their leaves thick, curved, acerose, 0.7-2 cm long, distichous 48. *A. pinifolium* Nevski.
- + Culms 20-75 cm tall; sterile shoots different 11.

11. Spikelets quite glabrous; glumes scabrous only on the keel, at the base of the awn 49. *A. pectiniforme* Roem. et Schult.
 + Spikelets copiously hairy 12.
 12. Spikes very dense, very slightly narrowed toward the top; spikelets closely pressed against each other, often purple-tinged 51. *A. cristatum* (L.) Gaertn.
 + Spikes dense, with distinct gaps between spikelets, usually not purple-tinged, markedly narrowed toward the top
 50. *A. imbricatum* (M. B.) Roem. et Schult.

655 39. *A. dasyanthum* Ldb. Ind. sem. Horti Dorpat. (1820) 3; Shmal'g. Fl. II, 658. - *Triticum dasyanthum* Ldb. ex Spreng. Syst. I (1825) 326; Griseb. in Ldb. Fl. Ross. IV, 339.

Perennial. Culms erect or geniculate at the base, 40-75 cm tall, glabrous, smooth; leaves subinvolute, to 3 mm broad, smooth, glabrous underneath, short-pubescent, glaucous-green on the upper surface. Spikes linear, rather loose, (7) 8-15 cm long, (0.8) 1-2 cm broad, with a rather pubescent rachis, the lower internodes of the rachis 0.6-1.2 cm long; spikelets pale green, subhorizontally spreading, not approximate (gaps between spikelets on one side of the spike to 0.7 cm), 0.7-1.2 cm long, 5-7-flowered; glumes keeled, lanceolate, subulate, gradually tapering from a broad base to a short awn-point, scarious-margined, glabrous or ciliate on the keel, 0.5-0.8 cm long; lemmas very densely covered with long white hairs, lanceolate, pointed, awnless, 0.7-0.85 cm long; palea linear, acuminate, bidentate, with a very narrow notch, minutely ciliate on the keels, as long as the lemma; anthers 0.5 cm long, nearly as long as the palea. June. (Plate XLVIII, Figure 1 a-d).

Sandy banks and hills. - European part: Prichern. Endemic. Described from Aleshkovskie sands. Type in Leningrad.

40. *A. tanaiticum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934).

Culms 35-90 cm tall; leaves involute, 1-2 mm broad, glaucous-green, smooth underneath, puberulent on the upper surface. Spikes linear, rather loose, 4-16 cm long, (0.4) 0.5-0.7 cm broad, rachis glabrous or puberulent, lower internodes of the rachis 0.4-1 cm long; spikelets pale green, subdivergent, erect, 0.7-1 cm long, 5-flowered; glumes keeled, lanceolate-subulate, rather gradually acuminate from a broad base, broadly scarious-margined, scaphoid, 0.3-0.7 (0.8) cm long; lemmas covered with long, white hairs or sometimes glabrescent, lanceolate, acuminate, awnless, 0.6-0.8 cm long; palea as long as the lemma, acuminate, bidentate, narrow-notched, sparsely ciliate on the keels. June.

Riverside sands. - European part: Low. Don. Endemic. Described from the river Chir. Type in Leningrad.

41. *A. cimmericum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934). - *A. dasyanthum* var. *birjuczensis* E. Lavrenko in Bull. Jard. Bot. Kieff, XII - XIII (1931) 148.

Perennial. Culms 50-80 cm tall, pubescent below the spike; leaves glaucous-green, flat, with inrolled margins, to 0.5 cm broad, glabrous, smooth underneath, very short-pubescent on the upper surface. Spikes 6-11 cm long, 1-1.8 cm broad, broadly linear, comb-like, with closely approximate, subimbricate spikelets; rachis pubescent, its lower

656 internodes 0.2-0.5 cm long; spikelets pale green, (0.8) 1-1.3 cm long, 6-7-flowered; glumes 0.4-0.6 cm long, lanceolate-subulate, rather gradually attenuate from a broad base to a subulate tip, with a prominent keel and faint 1-2 lateral nerves, glabrous, smooth, asymmetrical, with awn 1-2 mm long; lemmas densely covered with long, white hairs, lanceolate, 0.7-0.8 cm long, subulate-acuminate, with an awn-point to 1 mm long; palea linear-lanceolate, bidentate, narrowly notched, sparsely ciliate on the keels; anthers 3.5-4 mm long. June. (Plate XLVIIa, Figure 2 a-d).

Sandy banks and dunes. -European part: Crimea. Endemic. Described from Kerchenskii Peninsula. Type in Leningrad.

42. A. Michnoi Roshev. in Bull. Jard. Bot. Princ. URSS, XXVIII, (1929) 384.

Perennial. Culms 50-90 cm tall, glabrous, smooth; leaves flat, with inrolled margins, 5 mm broad, glabrous underneath; very short-pubescent on the upper surface. Spikes dense, 5-10 cm long, 1.2 cm broad, with a hairy rachis; spikelets pale, glaucous-green, 1.0-1.5 cm long, to 1 cm broad, spreading loosely 5-7-flowered; glumes keeled, scaphoid, scarious-margined, tapering from a broad base to an awn-point to 1 mm long, glabrous or ciliate on the keel; lemmas lanceolate, 0.6-0.8 cm long, tapering to an awn to 2 mm long, lanate, more rarely covered with short bristles; palea nearly as long as the lemma, acuminate, ciliate on the keels; anthers 5-5.5 mm long.

Sandy banks. -East. Siberia: Daur. Gen. Distr.: Mong. Described from the borders of Peschanyi Lake, near Troitskosavsk. Type in Troitskosavsk, cotype in Leningrad.

43. A. fragile (Roth) Nevski comb. nova. -*Triticum fragile* Roth, Catalecta bot. II (1800) 7. -*T. dasphyllum* Schrenk in Bull. Acad. Sc. Petersb. X (1842) 356; Griseb. in Ldb. Fl. Ross. IV, 339.

Perennial. Culms 50-75 cm tall, curved at the base, more or less covered with gray hairs; sheaths densely velutinous, with retrorse hairs; leaves flat, grayish-green, copiously hairy on both sides, soft, velutinous, sometimes less hairy and scaberulous on the upper surface, 0.3-0.5 cm broad. Spikes linear, 6-12 cm long, dense; spikelets ascending at an acute angle, imbricate in faintly comb-like arrangement; rachis rather hairy; spikelets pale green, 5-9-flowered, (0.8) 1-1.8 cm long, linear; glumes 0.5-0.7 cm long, lanceolate, tapering to an awn-point 1 mm long, keeled, with 1-2 faint lateral nerves, smooth, glabrous or ciliate on the keel; lemmas lanceolate, 0.6 cm long, scaberulous or smooth; palea as long as the lemma, bidentate at the summit, narrowly notched, long-ciliate on the keels; anthers 4 mm long.

Solonchak meadows, rather saline sands. -Centr. Asia: Aral. -Casp., Pribalkh. Endemic. Described from garden specimens grown from seed, obtained from unknown localities. Cotype in Leningrad.

44. A. sibiricum (Willd.) P. B. Agrost. (1912) 102; Shmal'g. Fl. II 659, pro parte; Kryl. Fl. Zap. Sib. II, pro parte. -*Triticum sibiricum* Willd. Enum. Hort. Berol. I (1809) 135; Griseb. in Ldb. Fl. Ross. IV, 338. -*T. variegatum* Fisch. ex Spreng. Pugill. II (1815) 24.

Perennial. Densely tufted; roots coated with grains of sand affixed by secretions of the root hairs; culms erect or geniculate at the base, 30-80 cm tall, glabrous, scaberulous below the spikes; sheaths glabrous, smooth or scaberulous; leaves narrowly linear, involute or flat, to 0.4-0.6 cm broad, glabrous, smooth underneath, scabrous on the upper sur-

face. Spikes linear, comb-like, many-flowered, (5) 7-10 (15) cm long, 0.5-1.2 cm broad; spikelets pale green, 4-9-flowered, in pectinate arrangement, 0.7-1 (1.5) cm long; glumes ovate-lanceolate, scaphoid, keeled, with faint lateral nerves, acuminate or terminating in an awn-point to 1.5 mm long, smooth or faintly scaberulous on the keel above (rarely sparsely ciliate), 0.5-0.7 cm long, often unequal, broadly scarious-margined; lemmas smooth, glabrous, 0.6-0.85 cm long, pointed; palea nearly as long as the lemma, acuminate, sharply bidentate at the summit, ciliate on the keels; anthers 3.5-4 mm long. June. (Plate XLVIIa, Figure 3, a-d).

Sandy steppes and sands. -European part: Low. Volg., Zavolzh.; Caucasus: Ciscauc.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral.-Casp., Pribalkh., Syr-Dar., Kara-Kum., Upp. Turkm. Described from Siberia. Type in Berlin.

45. *A. desertorum* (Fisch.) Schult. Mant. II (1824) 412. -*Triticum desertorum* Fisch. ex Link Enum. Hort. Berol. I (1821) 97; Griseb. in Ldb. Fl. Ross. IV, 338. -*Id.*: Ldb. Ic. pl. Fl. Ross. III, tab. 246.

Perennial. Densely tufted plants; culms geniculate at the base, 25-50 (60) cm tall, glabrous, scaberulous below the spike; sheaths of the lower leaves hairy, covered with spreading white hairs or glabrous; leaves stiff, glaucous-green, involute, narrow (2-3 mm broad), glabrous, smooth underneath, scabrous on the upper surface. Spikes short-linear, subcylindrical, with imbricate spikelets and rather hairy rachis; spikes 2.5-7 cm long and 0.5-0.9 cm broad, (3) 5-7-flowered, 0.7-1.2 cm long; glumes keeled, short-awned (awns to 2-3 mm long), ovate-lanceolate, glabrous and smooth, scabrous (more rarely ciliate) only on the keel below the awn, 0.3-0.4 cm long (excluding awn); lemmas 0.5-0.6 cm long, lanceolate, scaphoid, glabrous, smooth (more rarely pubescent), with awn 2-3 mm long; palea acuminate, sharply bidentate at the summit, ciliate on the keels; anthers 4 mm long. June. (Plate XLVIIa, Figure 4, a-d).

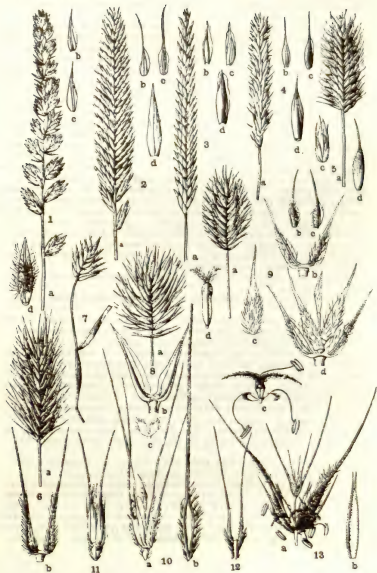
658 Clay steppes. -European part: Low. Don., Volg.-Don., Low. Volg., Zavolzh.; Caucasus: Ciscauc.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral.-Casp., Upp. Turkm., Kara-Kum., Kyz.-Kum., Pribalkh. Gen. Distr.: Dzung.-Kashg. Described from the steppes along the river Kum. Type in Leningrad.

46. *A. badamense* Drob. in Fedde, Repert. sp. nov. XXI (1925) 44.

Perennial. A densely tufted plant; culms thickened at base, 10-40 cm tall, slender, smooth; sheaths smooth; ligule obsolete; leaves short, subinvolute or flat, 0.3 cm broad, glabrous and smooth underneath, scabrous on the upper surface. Spikes 1.5-3 cm long, oblong-ovaloid, 0.6-0.9 cm

Explanation to Plate LXVIIa

1. *Agropyrum dasyanthum* Ldb.: a) spike; b and c) lower and upper glume; d) lemma. -2. *A. cimmericum* Nevski: a) spike; b and c) lower and upper glume; d) lemma. -3. *A. sibiricum* (Willd.) P. B.: a) spike; b and c) lower and upper glume; d) lemma. -4. *A. desertorum* (Fisch.) Schult.: a) spike; b and c) lower and upper glume; d) lemma. -5. *A. cristatum* (L.) Gaertn.: a) spike; b and c) lower and upper glume; d) lemma; e) spikelet. -6. *Eremopyrum distans* (C. Koch) Nevski: a) spike; b) glume; c) lodicules; d) ovary and stigma (b, c, d after Jaubert and Spach). -7. *E. triticum* (Gaertn.) Nevski: a) spike; b) glumes; c) lodicules; d) lemma; e) spikelet (b, c, and d after Jaubert and Spach). -8. *E. Buonapartii* (Spreng.) Nevski: a) spike; b) glumes; c) lodicules; d) lemma; e) spikelet (b, c, and d after Jaubert and Spach). -9. *E. orientale* Jaub. et Spach.: a) spike; b) glumes; c) lemma; d) spikelet (b, c, and d after Jaubert and Spach). -10. *Haynaldia villosa* (L.) Schur.: a) spikelet; b) glumes. -11. *Secale Kuprijanovii* Griseb. (spikelet). -12. *Secale silvestre* Host (glumes). -13. *Heteranthelium piliferum* Hochst.: a) fruiting spikelet; b) palea; c) floret, with glumes, lemma and palea removed (after Jaubert and Spach).



broad, not comb-like, dense; spikelets pale green or very slightly tinged, 0.9–1.2 cm long, 3–4-flowered; glumes lanceolate-subulate, gradually acuminate from a broad basis, or ovate-lanceolate, with an awn-point 0.5–1.5 mm long, smooth, lustrous, prominently keeled, 0.3–0.5 cm long (excluding awn); lemmas lanceolate, 0.5–0.6 cm long, glabrous, lustrous, with awn 1–2 mm long; palea as long as the lemma, acuminate, sharply bidentate at the summit, ciliolate on the keels; anthers 3 mm long. June.

Steppe slopes. —Centr. Asia: Syr-Dar., Pam. —Al. Endemic. Described from western Tyan'-Shan. Type in Tashkent.

47. *A. ponticum* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. I, 2 (1934). —*A. bulbosum* O. et B. Fedtschenko in Bull. Herb. Boiss. ser. 2, V (1905) 630, non Boiss.

Perennial. Culms thickened at the base, erect or slightly geniculate at the base, puberulent at the nodes and below the spike, 16–40 cm tall; sheaths of lower leaves covered with long, erect or subhorizontally spreading, white hairs; sheaths of upper leaves puberulent or glabrous, all sheaths long-ciliate on the margin; leaves of sterile shoots and lower culm-leaves sparsely long-ciliate on the margin, stiff, glaucous-green, upper culm-leaves short, with inrolled, nonciliate margins. Spikes short-linear or linear-ovaloid, 1.7–3 cm long, 0.7–1 cm broad, subcylindrical, dense, the spikelets not pectinately arranged, spikelets pale green, 3-flowered, 0.7–0.9 cm long; glumes lanceolate-subulate, tapering from a broad base to a scabrous awn 2–4 mm long, keeled, glabrous, 0.3–0.55 cm long (excluding awn); lemmas 0.7 cm long, glabrous, smooth, tapering to an awn 2–3 mm long; palea bidentate at the summit, ciliate on the keels, as long as the lemma; anthers 3–4 mm long. June.

Rocks. —European part: Crimea. Endemic. Described from Karadag. Type in Leningrad.

659 48. *A. pinifolium* Nevski in Acta Inst. Bot. Acad. URSS, ser. I, 2 (1934).

Perennial. A glaucous-green plant, forming dense tufts; culms 12–25 cm tall, glabrous, smooth; sterile shoots at the base of culms numerous, 3–4 cm tall, with bilaterally arranged, thick, acerose, involute, smooth, curved leaves 0.7–2 cm long; culm leaves stiff, thick, with inrolled margins, 0.9–2.3 cm long, narrowly linear; sheaths of upper leaves slightly inflated. Spikes ovoid or ovoid-ellipsoid, flattened, 1.3–2.2 cm long, 0.7–1.2 cm broad, bilateral, dense; spikelets glaucous-green, 3–5-flowered, 0.8–0.9 cm long; glumes ovate-lanceolate, 0.3–0.5 cm long (excluding awn), short-awned (awns 2–3 mm long), keeled, ciliate on the keels, the cilia implexed; lemmas lanceolate, 0.6 cm long, glabrous, slightly roughened with minute tubercles, awn 2 mm long; palea nearly as long as the lemma, bidentate at the summit, sparsely ciliate on the keels. May–June.

Marl and lime slopes. —Caucasus: West, Transcauc. Endemic. Described from the vicinity of Gelendzhik. Type in Leningrad.

49. *A. pectiniforme* Roem. et Schult. Syst. II (1817) 758. —*Triticum pectinatum* M. B. Fl. taur. —cauc. I (1808) 87, non R. Brown. (Prodr. Fl. Nov. Holl. I (1810) 179 = *Festuca pectinata* Labill. Nov. Holl. I (1804) 20 = *Agropyron pectinatum* P. B. Agrost. (1812) 102). —*Triticum pectiniforme* Steud. Nom. (1841) 855. —*T. cristatum* α *Typicum* Rgl. in A. H. P. VII (1880) 589. —*T. cristatum* β

pectinatum Rgl., l. c. - *Agropyron Dagnae* Grossh. in Monit. Jard. Bot. Tiflis 46-47 (1919) 44, tab. 4. - *A. cristatum* auct. Fl. Ross. pro parte.

Perennial. Culms 25-75 cm tall, usually scaberulous below the spike; sheaths of lower leaves glabrous, rarely somewhat hairy; leaves narrowly linear, involute or flat, with inrolled margins, usually 1.5-3 (5) mm broad, rarely broader (5-10 mm), smooth underneath, hairy or scabrous on the upper surface. Spikes dense, but with distinct gaps between the spikelets, oblong-ovoid or ovoid-linear, 1.5-5 (6.5) cm broad, distinctly narrowed toward the top, comb-like; spikelets green or glaucous-green, not imbricate, 3-10-flowered, quite glabrous, 0.8-1.5 cm long; glumes ovate-lanceolate, 0.3-0.5 cm long (without awn), abruptly narrowed to a short scabrous awn 2-3 mm long, asymmetrical, keeled, scabrous above on the keel; lemmas glabrous, 0.5-0.7 cm long, with awn 3-4 mm long; palea bidentate at the summit, ciliate on the keels; anthers nearly the length of palea, 4-5 mm long. June-July.

Steppes, rather stony steppe slopes, dry meadows. - European part: Mid. Dnep., Prichern., Crimea, Volg. - Don., Low. Don., Low. Volg., Zavolzh., Volg. - Kam. (southern part of the region); Caucasus: all regions; West. Siberia: Upp. Tob., Irt., Alt. (western part of the region); Centr. 660 Asia: Pri balkh., Dzung. - Tarb., Tyan'-Shan, Aral. - Casp., Syr-Dar., Upp. Turkm., Pam. - Al. (northern part of the region). Gen. Distr.: West. Medit., Centr. Eur. (southern part of the region), Balk. - As. Min., Arm. - Kurd., Iran. Described from Crimea. Type in Leningrad.

ECONOMIC IMPORTANCE. This species, with naked spikelets, represents a forage grass known as "broad-spike" or "crested" wheatgrass. It was first introduced into cultivation on a considerable scale in America, in 1906, the seed having been obtained from the former Samarskaya Guberniya. Practical trials with this species and the narrow-spike or desert wheatgrass (*A. desertorum*) were begun by V.S. Bogdan, and recently it has been concluded in a large number of experiment stations that both species are most valuable, drought-resistant forage grasses, producing excellent hay. Though not high, the hay yields of these wheatgrasses are steady in the first 4-5 years. According to the results obtained at the Krasnokutsk Experiment Station, the productivity of wheatgrasses may be expressed in the following figures: *A. pectiniforme* Yields 21.77 centners of hay and 2.3 centners of seeds per hectare, *A. desertorum* 26.7 and 3.59 centners, respectively. The yields of wheatgrasses recorded by the Balashov and Saratov experiment stations are lower: 12-15 centners per hectare.

50. *A. imbricatum* (M. B.) Roem. et Schult. Syst. II (1817) 757. - *Triticum imbricatum* M. B. Fl. taur.-cauc. I (1808) 88; III (1819) 95. - *Agropyron cristatum* Smal'g. Fl. II (1897) 659, pro parte. - *A. cristatum* var. *villosum* Litw. ex Schmalh., l. c.

Perennial. Culms 25-70 cm tall, glabrous or rather densely pubescent below the spike; sheaths of lower leaves glabrous, rarely somewhat hairy; leaves narrowly linear, involute or nearly flat, to 5 mm broad, smooth underneath, rather hairy on the upper surface. Spikes markedly attenuate toward the top, usually oblong-ovoid, dense, but with distinct gaps between spikelets, comb-like, 2-5 (6) cm long and 1-2.3 cm broad; spikelets grayish-green, very rarely faintly tinged with purple, not pressed against each

other, 3-10-flowered, hairy, 0.8-1.5 cm long; glumes ovate-lanceolate, 0.3-0.5 cm long (excluding awn), abruptly narrowed into awn 2-3 mm long, asymmetrical, long-ciliate on the keel; lemmas rather sparsely covered with spreading, long, white hairs, lanceolate, 0.5-0.7 cm long, with scabrous awn 3-5 mm long; palea bidentate at the summit, ciliate on the keels; anthers considerably exceeding half the length of palea, 4.5 mm long. June-July.

Stony steppe slopes. -European part: Mid. Dnep., Prichern., Crimea, Volg.-Don., Low. Don., Zavolzh., Volg.-Kam. (southern part of the region); Caucasus: all regions; a closely related, though not identical, form is known in Central Asia from Kara-tau Mountains. Gen. Distr.: West. Medit., Centr. Eur. (southern part of the region), Balk.-As. Min., Arm.-Kurd., Iran. Described from Georgia. Type in Leningrad.

- 661 51. *A. cristatum* (L.) Gaerth. in Nov. Comm. Acad. Petrop. XIV (1770) 540. -*Bromus cristatus* L. sp. pl. (1753) 78. -*A. cristatum* var. *imbricatum* Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) (1928) 358.

Perennial. Culms 25-60 (75) cm tall, usually puberulent, more rarely glabrous, below the spikes; sheaths of lower leaves densely hairy or glabrous; leaves narrowly linear, involute or flat, with inrolled margins, (1.5) 2-5 mm broad (very rarely broader, to 9 mm), glabrous underneath, rather hairy on the upper surface. Spikes very dense, without distinct gaps between spikelets, oblong-ovoid, lobed, usually very slightly narrowed toward the top, 1.5-5 (6) cm long and 1-2 (2.3) cm broad, crested, the rachis puberulent; spikelets grayish-green or rather tinged with purple, closely appressed, 3-10-flowered, villous, 0.8-1.5 cm long; glumes ovate-lanceolate, 0.3-0.5 cm long, (without awn), abruptly narrowed into awn 2-3 mm long, asymmetrical, long-ciliate on the keel; lemmas lanceolate, 0.5-0.7 cm long, with scabrous awn 1.75-2.5 (4) mm long; palea bidentate at the summit, ciliate or long-ciliate on the keels; anthers considerably exceeding half the length of the palea, 4 mm long. June-July. (Plate XLVIIa, Figure 5, a-e).

Rather stony steppe slopes, dry meadows. -West. Siberia: Irt. (eastern part of the region), Alt.; East. Siberia: Ang.-Sayan., Daur., Len.-Kol.; Far East: Ze.-Bur., Ussur.; Centr. Asia: Dzung.-Tarb., Tyan'-Shan (eastern part of the region), Pam.-Al. (eastern part). Gen. Distr.: Mong., Dzung.-Kashg., Tibet. Described from Eastern Siberia: Type in Leningrad.

Found in fossilized state in Quaternary layers, in mammoth's food.

NOTE. This species was described by Halenius (in Linnaeus, *Amoen. acad.* II (1751) as "*Bromus spiculis distiche imbricatis semilibus depressis*". Synonymous with it is "*Festuca culmo spicato, spiculis multifloris*" Gmel. (Fl. Sib. I (1745) 115, tab. 23), and the specimen, from which the description of Halenius was made, had been supplied to him Gmelin from Eastern Siberia. D. Litvinov (in Trav. Mus. Bot. Ac. Sc. Pétersb. V (1909) 42) has written quite erroneously that the plant described by Halenius and presented by Gmelin is *Triticum pectinatum* M.B. The latter species, renamed by Ramer and Schult as *Agropyrum pectiniforme* (by reason of homonymy) penetrates eastward only as far as Altai.

All species of the *Agropyrum cristatum* cycle produce occasionally creeping rhizomes.

Genus 198. EREMOPYRUM JAUB. et SPACH.

Jaub. et Spach. Ill. pl. Orien. IV (1850-1853) 26.

- 662 Spikes ellipsoid-ovoid or oblong-ovoid, with a short disarticulating rachis. Spikelets all alike, solitary, sessile, set at a nearly right angle to the rachis, 3-6-flowered, laterally compressed, short-awned or awnless. Glumes scaphoid, with a single prominent keel, coriaceous, with rather thickened and ultimately subhorneous margin. Lemmas scaphoid, pointed or short-awned. Lodicules ciliate on the margin. Annuals.

ECONOMIC IMPORTANCE. Species of the genus *Eremopyrum* develop in large concentrations in early spring in the desert and semi-desert zones of Central Asia, and only at that time they are of major importance as pasture plants.

1. Spikes glabrous, small, 1-1.7 (2) cm long, 0.6-1.3 (1.5) cm broad . . . 1. *E. triticeum* (Gaertn.) Nevski.
- + Spikes hairy or glabrous, but in the latter case larger (2-4.5 cm long, 1.5-2.3 cm broad) . . . 2.
2. Glumes linear, shorter than the spikelet, spiny-tipped . . . 3.
- + Glumes linear or linear-lanceolate, as long as the spikelet or nearly so, awned, awns the length of their glumes (0.4-0.8 cm long) . . . 4.
3. Spikelets glabrous . . . 2. *E. Buonapartis* (Spreng.) Nevski.
- + Spikelets hirsute . . . 3. *E. hirsutum* (Bertol.) Nevski.
4. Spikes ellipsoid-ovoid, 1.5-3 cm long, 0.9-1.6 (1.8) cm broad; glumes linear-lanceolate, contorted, with awns 0.4-0.6 cm long . . . 4. *E. orientale* (L.) Jaub. et Spach.
- + Spikes oblong-ovoid, 2.3-5.5 cm long, 1.4-2.5 cm broad; glumes very narrow, linear, slightly contorted, with awns 0.6-0.8 cm long . . . 5. *E. distans* (C. Koch.) Nevski.

1. *E. triticeum* (Gaertn.) Nevski comb. nova. - *Agropyrum triticeum* Gaertn. Nov. Comm. Acad. Petrop. XIV (1770) 540; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 358. - *Secale prostratum* Pall. It. I (1771) 168. - *Triticum prostratum* L. fil. Supp. (1781) 114; Griseb. in Ldb. Fl. Ross. IV, 336. - *Agropyron prostratum* P. B. Agrost. (1812) 146. - Ic.: Gaertn., l. c., tab. 19; 4-5. - Exs.: HFR No 849.

Annual. Culms geniculate at the base, 3-30 cm tall (rarely taller), puberulent below the spike; sheaths of upper leaves inflated; leaves thin, very scabrous or sparsely covered with short hairs. Spikes small, ellipsoid-ovoid or subglobose, 1-1.7 (2) cm long, 0.6-1.3 (1.5) cm broad, contracted, dense, with slightly disarticulating rachis; spikelets green, glabrous, 3-6-flowered, 0.6-1 cm long, closely imbricated, strongly spreading at a right or nearly-right angle to the rachis; glumes lanceolate, 0.45-0.6 cm long, subulate-tipped, thick-keeled, 1/2-2/3 as long as the entire spikelet; lemmas 0.5-0.6 cm long, with an awn-point 1 mm long; palea shorter than the lemma, bidentate at the summit. May. (Plate XLVIIa, Figure 7).

- 663 Wormwood and needlegrass steppes; dry slopes; solonchaks sites. - European part: Prichern., Crimea, Low. Don., Volg.-Don., Zavolzh., Low. Volg.; Caucasus: Ciscauc., Transcauc.; West. Siberia: Irt., Upp.

Tob.; Centr. Asia: Kara-Kum., Upp. Turkm., Kyz.-Kum., Syr-Dar., Pam.-Al., Tyan'-Shan, Pribalkh., Aral.-Casp. Gen. Distr.: Balk.-As. Min., Arm.-Kurd. Described from the valley of river Yaik (Ural).

2. *E. Buonapartis* (Spreng.) Nevski comb. nova. - *Triticum Buonapartis* Spreng. Erst. Nachr. Bot. Gart. z. Halle (1801) 40. - *T. squarrosus* Roth, Neue Beitr. zur Bot. (1802) 129; Griseb. in Ldb. Fl. Ross. IV, 337. - *Agropyrum Buonapartis* Th. Dur. et Schinz, Consp. fl. Afric. V (1894) 936. - *A. turkestanicum* Gandoger in Bull. Soc. Bot. Fr. (1913) 420. - Exs.: HFR No 1899.

Annual. Culms 5-30 cm tall, geniculate at the base, ascending, rather purple-tinged near the base, pubescent below the spike; sheaths not inflated, the upper ones slightly dilated, glabrous, more rarely puberulent, scabrous; leaves flat, 2-5 mm broad, scabrous, green. Spikes ovaloid, lobed, 2-4.5 cm long, 1.5-2.5 (2.8) cm broad, green or faintly colored, glabrous; spikelets loosely 3-5-flowered at maturity, 1.2-1.5 cm long, divergent, bilateral, in pectinate arrangement, closely pressed against each other; glumes linear, shorter than the spikelet, strongly laterally compressed, gradually tapering, subulate-tipped, 0.9-1.4 cm long; lemmas linear-lanceolate, glabrous, 1.2-1.4 cm long, gradually tapering to an awn 1.5-3 mm long; palea considerably shorter and narrower than the lemma, bidentate at the summit, with short thick cilia on the keels. April-May. (Plate XLVIIa, Figure 8, a-d).

Sands, Haloxylon "forests"; also occurs as a weed in the desert and semi-desert zones. - Caucasus: South. and East. Transcauc.; Centr. Asia: Kara-Kum., Kyz.-Kum., Amu-Dar., Pam.-Al., Syr-Dar., Tyan'-Shan., Pribalkh., Aral.-Casp. Gen. Distr.: East. Medit., Balk.-As. Min., Arm.-Kurd., Iran. Described from Egypt. Cotype in Leningrad.

3. *E. hirsutum* (Bertol.) Nevski comb. nova. - *Hordeum hirsutum* Bertol. Misc. Bot. I (1842) 11. - *Agropyron orientale* var. *sublanuginosum* Drob. in Trav. Mus. Bot. Acad. Sc. Petrogr. XVI (1916) 135. - *A. Buonapartis* var. *pilosum* Grossh. Fl. cauc. I (1928) 134. - Ic.: Jaub. et Spach, III, pl. orient. IV, tab. 320 (sub nom. *E. squarrosus*).

Annual. Culms 5-17 cm tall, geniculate at the base, pubescent below the spike; sheaths not inflated, the upper ones slightly dilated, scabrous; leaves flat, 2-4 mm broad, puberulent and scabrous, green. Spikes oval, 664 lobed, 2-4 cm long and 1.5-2.5 cm broad, green, hirtellous; spikelets loosely flowered at maturity, 1.2-1.5 cm long, 3-5-flowered, divergent, closely appressed; glumes linear, shorter than the spikelet, strongly compressed laterally, hispidulous on the keel and sides, gradually subulate-pointed, 0.9-1.3 cm long; lemma linear-lanceolate, scabrous due to stiff, spreading bristles, 1.2-1.3 cm long, tapering into awn 1.5-3 mm long; palea 0.6-0.8 cm long, bidentate at the summit, with short thick cilia on the keels. April-May.

Red-sandstone hills, stony slopes. - Caucasus: South. Transcauc.; Centr. Asia: Pam.-Al. Gen. Distr.: Iran, Arm.-Kurd. Described from the Euphrates valley.

4. *E. orientale* (L.) Jaub. et Spach. Ill. pl. Orient. IV (1850-1853) 26. - *Secale orientale* L. Sp. pl. (1753) 84. - *Triticum orientale* M. B. Fl. taur.-cauc. I (1809) 86; Griseb. in Ldb. Fl. Ross. IV, 336. - *Agropyrum orientale* Roem. et Schult. Syst. II (1817) 757;

Shmal'g. Fl. II 660, pro parte; Kryl. Fl. Zap. Sib. II, 359. -Ic.: Jaub. et Spach., l. c., tab. 319. -Exs.: HFR No 798.

Annual. Culms geniculate, hairy below the spike, 4-25 cm tall; sheaths of lower leaves scabrous, puberulent; sheath of the uppermost leaf inflated; leaves flat, green, 3-4 mm broad, scabrous, often puberulent underneath, the nerves short-pilose on the upper side. Spikes ellipsoid-ovoid, villous, 1.5-3 cm long, 0.9-1.6 (1.8) cm broad, readily disarticulating. Spikelets green, 3-5-flowered, 0.9-1.2 cm long; glumes hairy, linear-alnecolate, long-acuminate with awn 4-6 mm long (about the length of glume), keeled, with 2-3 distinct lateral nerves, asymmetrical, laterally much compressed, contorted, nearly as long as the spikelet (length of glume including awn 0.8-1.2 cm); lemmas hairy, gradually tapering to a scabrous awn 0.4-0.5 cm long; palea linear, acuminate, sharply bidentate at the summit, with a very narrow notch, sparsely short-ciliate on the keels. April-May. (Plate XLVIIa, Figure 9, a-c).

Wormwood steppes, sands, dry barren slopes. -European part: Prichern., Crimea, Low. Don., Volg. -Don., Zavolzh., Low Volg.; Caucasus: Ciscauc., West., East and South Transcauc.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Kara-Kum., Aral.-Casp., Pribalkh., Tyan'-Shan. Gen. Distr.: West. and East. Medit., Arm.-Kurd. Described from the Mediterranean area. Type in London.

ECONOMIC IMPORTANCE. An excellent spring pasture grass for all kinds of animals. Contains a large amount of protein (up to 12-14%) and relatively little cellulose (24-27%).

- 665 5. *E. distans* (C. Koch) Nevski comb. nova. -*Agropyrum distans* C. Koch in Linnaea, XXI (1848) 426. -*A. lasianthum* Boiss. Diagn. ser. 1, XIII (1854) 68.

Annual. Culms geniculate near the base, hairy below the spike; the uppermost sheath slightly dilate, but not inflated. Leaves flat, green, scabrous, sometimes sparsely short-pilose on the veins on the upper side, rather puberulent underneath. Spikes oblong-lobed, or oblong-ovoid, 2.3-5.5 cm long, 1.4-2.5 cm broad, dense, though spikelets more loosely arranged than in *E. orientale*, villous, readily disarticulating; spikelets green or slightly purple-tinged, 3-5-flowered, 1.3-1.7 cm long; glumes as long as the spikelet, 1.3-1.7 cm long (including awn), long-ciliate, linear, very narrow, gradually tapering to a slender, scabrous awn 0.6-0.8 cm long, strongly compressed, keeled, slightly contorted, lateral nerves less distinct than in *E. orientale*; lemmas long-villous, gradually tapering to a slender scabrous awn 0.5-0.7 cm long; palea acuminate, long-bidentate at the summit, with a very narrow notch. May. (Plate XLVIIa, Figure 6, a-b).

Wormwood steppes, sands, dry clayey slopes. -European part: Low. Volg.; Caucasus: East. and South. Transcauc.; Centr. Asia: Kara-Kum., Kyz.-Kum., Syr-Dar., Pam.-Al., Tyan'-Shan., Pribalkh., Aral.-Casp. Gen. Distr.: Arm.-Kurd. Described from Armenia. Type in Berlin.

Genus 199. HAYNALDIA* SCHUR.

Schur, Enum. pl. Transsilv. (1866) 807.

Spikes with a short, readily disarticulating, ciliate rachis. Spikelets solitary, all of one kind, 2-4-flowered; fertile florets 2 or 1, the upper floret long-pedicelled, sterile. Glumes with 2 ciliate keels (cilia in tufts), long-awned, obtusely bidentate at the base of the awn, broadly channelled between the keels. Lemmas of fertile florets long-awned, bidentate at the base of the awn. Palea much narrower than the lemma. Anthers exceeding half the length of palea. Caryopsis laterally compressed, short, furrowed, hairy on the top. Annual plants.

1. *H. villosa* (L.) Schur, Enum. pl. Transsilv. (1866) 807. - *Secale villosum* L. Sp. pl. (1753) 84. - *Triticum villosum* M. B. Fl. taur. - cauc. I (1809) 85; Griseb. in Ldb. Fl. Ross. IV, 336. - *Agropyrum villosum* Link. Hort. Berol. I (1827) 31; Shmal'g. Fl. II, 660. - Ic.: Host, Gram. II (1802) tab. 47.

Annual. Culms subgeniculate at the base, (16) 20-100 cm tall, glabrous, smooth; leaves flat, narrowly linear, to 0.5 cm broad, scabrous, covered with scattered hairs; ligule ciliate. Spike dense, broadened toward the top, (3) 4.5-9.5 cm long (including awns), 0.8-1.9 cm broad; spikelets 0.9-1.7 cm long (excluding awns); glumes cuneate-attenuate toward the base, 0.5-0.85 cm long, with awn 2-3.5 cm long; lemmas 0.8-1.3 cm long, keeled, with 2 pairs of lateral nerves, glabrous in lower part, hairy at the summit below the awn (hairs in tufts); awn 2.5-3.5 cm long, scabrous, straight; palea 1.2 cm long; anthers 6.5 mm long. May. (Plate XLVIIa, Figure 10, a-b).

Chalky, calcareous, and dry slopes. - European part: Crimea; Caucasus: Ciscauc., West. Transcauc. Gen. Distr.: South. Eur., West. Medit., Balk. - As. Min. Described from southern Europe. Type in London.

Genus 200. SECALE** L.

L. Gen. ed. I. (1737) 17.

Spikes 2-rowed, very dense, rachis usually very brittle, hairy, short-jointed. Spikelets solitary, sessile, 2-flowered, occasionally with a rudiment of third floret. Glumes linear-subulate, keeled, usually shorter than the lemma and palea. Lemmas lanceolate, keeled, hispid on the keel, asymmetrical, tapering into a long, straight, scabrous awn. Palea bidentate, scabrous on the keels and ciliate in upper part. Lodicles ciliate above. Stamens 3. Caryopsis oblong, somewhat laterally compressed, deeply furrowed, pubescent on the top. Annual, rarely perennial, grasses, with fibrous roots.

1. Glumes long-awned, the awn 2-3 times the length of the glume (1.5-2.3 cm long) 1. *S. silvestre* Host.

* Named for Stefan Haynald (1816-1891) of Transylvania.

** Old Latin name for rye (according to Filay).

- + Glumes awnless or bearing a very short awn 2.
- 2. Spikes pliant, not brittle. Annual plants (winter or spring), cultivated or field-weeds 2. *S. cereale* L.
- + Spikes very brittle. Perennials or annual plants 3.
- 3. Annual, 20-40 cm tall 3. *S. Vavilovii* Grossh.
- + Perennials, 60-150 cm tall 4.
- 4. Leaves 0.3-0.5 cm broad, often involute. Awn twice as long as its lemma, more rarely of same length. Culms 60-90 cm tall 4. *S. anatolicum* Boiss.
- + Leaves 1-1.5 cm broad, flat. Awn as long as its lemma. Culms 80-120 (150) cm tall 5. *S. Kuprijanovii* Grossh.

1. *S. silvestre* Host, Gram. Austr. IV (1809) 7, tab. II. — *S. campestre* Kit. apud Schult. Oesterr. Flora, 2 Aufl. I (1814) 197. — *S. fragile* M. B. Fl. taur.-Cauc. III (1819) 93; Griseb. in Ldb. Fl. Ross. IV, 334; Shmal'g. Fl. II, 660. — Exs.: HFR No 98.

- 667 Annual. Culms erect or geniculate at the base, 20-50 cm tall, pubescent below the spike; leaves short, narrowly linear, 2-3 mm broad, flat or involute, glabrous, or the lower ones pubescent. Spike broadened in upper part, very dense and brittle, 2-8 cm long (excluding awns), the rachis villous on the angles; spikelets 2-3-flowered; glumes linear-subulate, to 9 mm long, with awns 1.5-2.3 cm long, scabrous on the keel; lemmas ca. 1 cm long, hispid on the keel and margins, prolonged into a long, scabrous, straight awn 4-7 (8) cm long. May-June. (Plate XLVIIa, Figure 12).

Sands. — European part: Mid. Dnep., Upp. Dnep., Prichern., Volg.-Don., Low. Don., Low. Volg., Crimea; Caucasus: Ciscauc., Dag., East. Transcauc.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Pribalkh., Aral. — Casp., Kyz.-Kum., Syr-Dar., Pam.-Al., Kara-Kum. Gen. Distr.: Centr. Eur. (southern part of the region); Balk.-As. Min. Described from Hungary. Type in Vienna.

NOTE. Transcaucasian specimens of *S. silvestre* differ from the type in low, strongly geniculate culms and long spikes, with relatively long awns. Additional accumulation of herbarium material will make it possible to test the homogeneity of *S. silvestre* over its entire distribution area.

ECONOMIC IMPORTANCE. It is doubtful if *Secale silvestre* is likely to be of practical importance. There are, however, indications in the literature that in northern Caucasus *Secale silvestre* is cut for hay in years particularly favorable for its development. Seeding trials were carried out with this plant in agricultural experiment stations, but very low yields of grain were obtained.

2. *S. cereale* L. Sp. pl. (1753) 84. — *S. turkestanicum* Bensin in Bull. Torr. Club LX, 3 (1933) 156.

Annual or biennial. Culms glabrous, or pubescent below the spike, 60-200 cm tall; leaves broadly linear, flat, scabrous and glabrous on the upper surface. Spikes not brittle, with a firm, continuous rachis, dense, 2-rowed, 5-15 cm long, 0.7-1.2 cm broad; spikelets 2-flowered, with a rudiment of third floret; glumes linear-subulate, gradually acuminate, scabrous on the keel, awnless or bearing an awn 2-3 mm long; lemmas ca. 1.5 cm long, long-awned, 5-nerved, slightly longer than the glumes,

with fairly thick, subfalcate bristles on the keel; awns scabrous, straight, 2-5 cm long; caryopsis deeply furrowed. June.

NOTE. A widely known cultivated plant, grown mainly in the forest zone of the U.S.S.R. In the southern part of Central Asia and in Transcaucasia *Secale cereale* occurs wild as a weed among winter wheat. This wild rye has recently been described by Bensin as a distinct species, but in our opinion, it does not differ morphologically from cultivated rye and is directly involved in the origin of the latter. N.I. Vavilov was the first to elucidate the problem of provenance of cultivated rye. According to his theory, the ancient cultivation of winter wheat carried rye with it as a weed. As wheat cultivation spread northward into more severe climatic conditions, rye, as a weed, began to displace the cultivated plant and thus marked the initiation of a new crop.

As far as wild-growing *Secale cereale* L. is concerned, it is closely related to a group of species referred to as *Secale montanum* Guss. by way of *Secale Vavilovii* Grossh. an annual species with a brittle spike.

3. *S. Vavilovii* Grossh. in Bull. of Applied Botany and Plant-Breeding XIII 2 (1924) 474.

Annual. A glaucous plant with readily effaceable bloom; culms 20-40 cm tall; leaves numerous at the base of culms, to 0.5 cm broad, scabrous on the upper surface, smooth underneath, with inrolled margins; uppermost leaf close to base of the spike. Spikes 4-8 cm long, 0.6-0.8 cm broad, erect, dense, the brittle rachis hairy on the angles; spikelets 2-flowered; glumes linear, 0.8-1 cm long (including awn), about as long as the lower floret, keeled, tapering into an awn 2-2.5 mm long; lemma 1-1.1 cm long, lanceolate, prolonged into awn 1-2 cm long. May.

Sands. -Caucasus: South. Transcauc. Gen. Distr.: Arm.-Kurd. Described from the area between Obdubad and Karchevan, in the Araks valley. Type in Tiflis, cotype in Leningrad.

4. *S. anatolicum* Boiss. Diagn. ser. 1, V (1844) 76; Griseb. in Ldb. Fl. Ross. IV, 334.

Perennial. A tufted plant; culms 60-90 cm tall, 2-3 mm in diameter; leaves linear, (2) 3-5 mm broad, grayish-green, flat or with inrolled margins, glabrous. Spikes linear, dense, 6-8 cm long, contracted, the rachis very brittle, hairy on the angles; glumes linear, 0.9-1.1 cm long, keeled, pointed, as long as or slightly shorter than the lemmas; lemmas 0.9-1.2 cm long, lanceolate, prolonged into a straight, scabrous awn 0.9-2.5 cm long, the awn twice as long, rarely as long, as its lemma. June-July.

Stony slopes in the high-mountain zone. -Caucasus: East. and South. Transcauc. Gen. Distr.: Balk.-As. Min., Arm.-Kurd. Described from the Smyrna area. Type in Geneva.

5. *S. Kuprijanovii* Grossh. Fl. Cauc. I (1928) 136.

Perennial. A tufted plant; culms 80-120 (150) cm tall, stout, 5-6 mm in diameter, densely covered with long hairs below the spike; leaves broadly linear, 10-20 mm broad, green or glaucous-green, flat, scabrous and covered with scattered hairs on the upper surface, scabrous and glabrous underneath. Spikes linear, dense, 10-12 cm long, the rachis very brittle, covered with long white hairs on the angles; glumes 1-1.2 cm long, narrowly linear, scabrous on the keel; lemmas lanceolate, 1.2-1.6 cm long, hispid on the keel (with thick, flaccate bristles), prolonged into a straight,

- scabrous awn 1.4-1.5 cm long, usually the length of lemma. July. (Plate XLVIIa, Figure 11).
- 669 Mountain meadows.-Caucasus: Ciscauc., West. Transcauc. Endemic. Described from northern Caucasus. Type in Tiflis.

Genus 201. AEGILOPS* L.

L. Gen. plant. (1737) 543.

Spikelets solitary, sessile, 2-5-(7)-flowered, rather turgid, the uppermost spikelet usually neuter, differing in appearance from the other spikelets. One or two of the upper florets in the spikelet sterile. Glumes coriaceous or cartilaginous, keelless (rarely with a very faint keel), many-nerved, rather scabrous or hairy, truncate or mostly toothed at the summit, the teeth often extended into rather long awns. Lemmas keelless, convex, with nerves not connivent at the summit and 1-3 teeth or awns. Caryopsis oblong-oval, furrowed, hairy on the top, free or adhering to lemma and palea. Spikes disarticulating, usually with 1-3 small, rudimentary spikelets at the base.

1. Spikes to 12 cm long (excluding awns), linear, cylindrical or submoniliform, containing (4) 5-11 (13) spikelets, brittle, disarticulating in maturity into separate spikelets, more rarely falling entire. Glumes awnless or terminating in short teeth, rarely 2-4-awned. Caryopsis adhering with lemma and palea. 2.
- + Spikes 1-4 cm long (without awns), oval or narrowly lanceolate, containing 2-5 (6) spikelets, falling entire, disarticulating above the rudimentary spikelets. Glumes 2-5-awned. Caryopsis free or adhering to lemma and palea. (Sect. III *Pleionanthera* Eig.) 5.
2. Spikes cylindrical, usually falling entire; glumes of lateral spikelets 2-toothed, one of the teeth very short, broad, triangular, the other narrow and produced into an aristate appendage or an awn (Sect. I *Monoleptanthera* Eig.) 1. *Ae. cylindrica* Host.
- + Spikes submoniliform or cylindrical, but in the latter case the glumes perfectly toothless, horizontally truncate. Rachis readily disarticulating in maturity into individual spikelets; glumes awnless, or 2-toothed, or awned. (Sect. *Pachystachys* Eig.) 3.
- 670 3. Spikes cylindrical; glumes perfectly toothless, horizontally truncate, scabrous or nearly smooth 2. *Ae. squarrosa* L.
- + Spikes submoniliform; glumes toothed or awned, hairy 4.
4. Glumes bidentate, usually with very short teeth, one of the teeth broad, rounded at the tip, the other narrower; number of spikelet 5-8 (11) 3. *Ae. crassa* Boiss.
- + Glumes bearing 2-4 narrow, flat awns; spikelets 4-5 4. *Ae. juvenalis* (Thell.) Eig.
5. Glumes or the lowest perfect spikelet 4-awned; spikes broadly oval or narrowly lanceolate, 1-2.3 cm long (excluding awns), 0.4-0.9 cm broad; spikelets ventricose, number of rudimentary spikelets, 1, rarely 2 9. *Ae. ovata* L.

* From Greek *Aegilops*, a name employed by Theophrastus for a kind of grass.

- + Glumes of the lowest perfect spikelet 2-3-awned; spikes narrowly lanceolate, lanceolate, or linear-lanceolate, 2-4 cm long (excluding awns), 0.3-0.8 cm broad; spikelets not ventricose (merely slightly convex); rudimentary spikelets 1-3 6.
- 6. Spikelets 2 (rarely 3); glumes of the lowest spikelet 2-awned; rudimentary spikelets at the base of spike 1, rarely 2 7. *Ae. biuncialis* Vis.
- + Spikelets 3-6; glumes 2-3-awned; rudimentary spikelets at the base of spike 3, more rarely 2 7.
- 7. Uppermost spikelet abortive; one of the glumes of the lowest fertile spikelet 3-awned, the other 2-awned (rarely 3-awned), hairy, more rarely scaberulous. Spikes abruptly narrowed toward the top 8. *Ae. triaristata* Willd.
- + Uppermost spikelet 3-flowered, with 1 perfect floret; both glumes of the lowest perfect spikelet 3-awned (more rarely bearing 2 awns and 1 tooth), usually very scabrous; spikes gradually narrowed toward the top 8.
- 8. Caryopsis adhering to lemma and palea; nerves of the glumes narrow, thin, parallel or nearly so, internerves broad 6. *Ae. Kotschyi* Boiss.
- + Caryopsis free; nerves of the glumes broad, not parallel, internerves narrow 7. *Ae. triuncialis* L.

Section 1. *Monoleptathera* Eig. in Fedde, Repert. Beih. LV (1929) 98. (Characters in the key).

- 671 1. *Ae. cylindrica* Host, Gram. Austr. II (1802) 6, tab. 7, -*Ae. caudata* Griseb. in Ldb. Fl. Ross. IV, 326, non L. - *Triticum cylindricum* Casati, Comp. (1869) 86; Shmal'g. Fl. II, 661.

Annual. Culms 20-50 cm tall, slightly geniculate at the base, numerous; leaves flat, scabrous (on the undersurface only in terminal part), slightly hairy or glabrous on both sides. Spikes narrowly cylindrical, 7-12 cm long, 0.3-0.4 cm broad, slightly narrowed toward the top, usually falling entire; spikelets 6-10 (11) (not counting the 1-2 rudimentary spikelets at the base of the spike), 3-4-flowered; glumes 7-9-nerved, very scabrous, 0.6-1 cm long, 2-toothed at the summit, one of the teeth triangular, broad, obtuse, short, the other narrow, produced into an aristate appendage or awn; glumes of the terminal spikelet with awn 2.5-7 cm long from between 2 short teeth; lemmas in lateral spikelets 2-toothed at the summit, in terminal spikelet also bearing a long awn. May-June. (Plate XLVIII, Figure 1, a-c).

Weedy and sandy places. - European part: Prichern., Mid. Dnep., Low. Don.; Crimea; Caucasus: Ciscauc., Dag., West., East., and South. Transcauc.; Centr. Asia: Pam.-Al., Syr-Dar., Tyan'-Shan. (Adventive specimens have also been collected near Saratov and in the Leningrad Oblast'). Gen. Distr.: Centr. Eur., Balk.-As. Min., Arm.-Kurd. Described from southern Europe. Type in Vienna.

Section 2. *Pachystachys* Eig. in Fedde, Repert. Beih. LV (1929) 85. (Characters in the key).

2. *Ae. squarrosa* L. Sp. pl. (1753) 1051; Griseb. in Ldb. Fl. Ross. IV, 326. - *Ae. squarrosa* β *Meyeri* Griseb., l. c. - *Ae. Tauschii* Cosson, Not. sur quelq. pl. II (1849) 69. - *Triticum Tauschii* Schmalh. Fl. II (1897) 652. - Ic.: Schreb. Besch. Gräs. II 2 (1769) tab. 22, fig. 2.

Annual. Culms numerous or 2-1, geniculate at the base, 20-40 cm tall; leaves glabrous or sparsely hairy. Spikes linear, cylindrical, readily breaking up; spikelets (5) 7-10 (13), cylindrical, (3)-4-(5)-flowered; glumes rectangular in outline, 0.4-0.6 cm long, 0.3-0.4 cm broad, 7-9-nerved, scabrous or nearly smooth and shining, awnless, truncate, thickened at the margin; lemmas longer than the glumes, one margin produced onto a tooth or short awn; awns 0.5-3.5 cm long, progressively increasing in length toward the top of the spike. May-June. (Plate XLVIII, Figure 2, a-c).

Argillaceous semi-deserts, dry hills; also occurring in weedy places. - Caucasus: Ciscauc., Dag., West., East, and South. Transcauc.; Centr. Asia: Upp. Turkm., Pam.-Al., Syr-Dar., Tyan'-Shan., Dzung.-Tarb. Gen. Distr.: Arm.-Kurd., Iran. Described from Asia Minor. Type in London.

3. *Ae. crassa* Boiss. Diagn. ser. 1, VII (1846) 129.

Annual. Culms subgeniculate at the base, 20-45 cm tall, fairly thick; leaves broadly linear, to 0.8 cm broad, scabrous, glabrous or sparsely hairy; sheaths sometimes ciliate on the margins. Spikes long, plump, to 0.7 cm broad, submoniliform, appressed-pilose, readily breaking up; spikelets 5-8 (11), cylindrical, slightly enlarged toward the base, (3)-4-(5)-flowered; rudimentary spikelets 1-2 or 0; glumes 0.7-1 cm long, 0.4-0.5 cm broad, asymmetrical at the summit, with a single, usually very short, narrow tooth on one side, and a very short, broad, rounded protrusion on the other side; glumes of uppermost spikelets symmetrical, with a short median tooth; lemmas in lateral spikelets with an aristate appendage or a short awn, in terminal spikelets with a longer, explanate awn 0.8-6 cm long. May-June. (Plate XLVIII, Figure 3, a, b).

Clayey semi-desert and submontane slopes.-Centr. Asia: Syr-Dar., Pam.-Al., Upp. Turkm. Gen. Distr.: Iran, East. Medit. Described from the ruins of Persepolis. Type in Geneva.

4. *Ae. juvenalis* (Thell.) Eig in Fedde, Repert. Beih. LV (1929) 93. - *Triticum juvenale* Thell. in Fedde, Repert. sp. nov. III (1907) 281. - *Ae. turcomanica* Roshev. in Bull. of Appl. Bot., Gen., and Plant-Breed. XVIII (1928) 413, tab. 1. - *Triticum turcomanicum* Roshev., Consp. Gram. Turkest. (1923) 91, nomen.

Annual. Culms 20-40 cm tall, geniculate at the base, glabrous or scarcely hairy below the spike; leaves to 0.5 cm broad, glabrous, scabrous on the upper surface; sheaths ciliolate on the margins. Spikes of medium size, plump, linear, moniliform, readily breaking up, appressed-pilose; spikelets 4-5 (7), enlarged toward the base, 3-4-flowered, elliptical; rudimentary spikelets 1-2 or 0; glumes ca. 0.8 cm long and ca. 0.6 cm broad, many-nerved, with 2-4 narrow, flat awns, longer in terminal spikelets; lemmas pubescent at the summit, with 1 awn and 2 teeth, or 3-awned. May.

Semi-desert slopes.-Centr. Asia: Upp. Turkm., Syr-Dar., Pam.-Al. Gen. Distr.: Iran. Described from Juvenal port, near Montpellier, where it was collected, as an adventive plant. Type in Zurich.

Section 3. *Pleionanthera* Eig in Fedde, Repert. Beih. LV (1929) 117. (Characters in the key).

5. *Ae. triuncialis* L. Sp. pl. (1753) 1051; Griseb. in Ldb. Fl. Ross. IV, 327. — *Triticum triunciale* Raspail in Ann. Sc. nat. sér. I V (1825) 435; Shmal'g. Fl. II, 662. — Ic.: Host, Gram. Austr. (1802) tab. 6.

Annual. Culms geniculate at the base, 20–45 cm tall; leaves sparsely covered with long hairs. Spikes narrowly lanceolate, 3–4 cm long (excluding awns), 0.4–0.7 cm broad, with 3, more rarely 2, rudimentary spikelets; spikelets 4–5 (rarely 3 or 6), narrowly lanceolate, the lower ones 3–4-flowered, with only 2 perfect florets, the upper ones 3-flowered, with a single perfect floret; glumes with broad, nonparallel, very scabrous
673 nerves, in lower spikelets with 3 or 2 awns 1–3 cm long (the middle awn usually shorter, 0.5–2 cm long), in uppermost spikelets with 3 longer awns (4.5–6 cm long), the glumes (0.7) 0.8–0.9 cm long, 0.3–0.5 cm broad; awns dilated below, more or less spreading. Lemmas 0.7–1 cm long, with 3–2 awns 2–3.5 cm long (in uppermost spikelets 3–5.5 cm long), sometimes all awns, or some of them, shorter. Caryopsis free. May–June. (Plate XLVIII, Figure 4, a, b).

Semi-desert submontane slopes; also occurring as a weed in unirrigated fields. — European part: Crimea; Caucasus: Tal., East. Transcauc., Dag.; Centr. Asia: Syr-Dar., Pam.-Al., Upp. Turkm., Kara-Kum. Gen. Distr.: Medit., Balk.-As. Min., Arm.-Kurd., Iran, East. Medit. Described from the Orient. Type in London.

6. *Ae. Kotschyi* Boiss. Diagn. ser. 1, VII (1846) 129.

Annual. Culms 15–25 cm geniculate at the base; leaves glabrous or slightly hairy. Spikes narrowly lanceolate or linear-lanceolate, 2–3 cm long (without awns), 0.25–0.5 cm broad, falling entire at maturity; spikelets (2)–4–(6), linear or elliptical-linear; lower spikelets 3–4-flowered, with 2–3 perfect lateral florets; uppermost florets 3-flowered, with 1 perfect floret; glumes 0.5–0.7 cm long, 0.25–0.4 cm broad, with thin, parallel nerves and broad internerves; awns of glumes 3 or 2–5 (in uppermost spikelets), slender, delicate, parallel; lemmas 1–3-awned; caryopsis adhering to lemma and palea in maturity. May.

Semi-desert and steppe slopes. — Caucasus: East. Transcauc., Tal. Gen. Distr.: Iran, Medit., Arm.-Kurd. Described from southern Persia. Type in Geneva.

7. *Ae. biuncialis* Vis. Fl. Dalm. I (1842), tab. I, fig. 2; Fl. Dalm. III (1852) 344.

Annual. Culms decumbent at the base, geniculate, ascending, 15–30 cm tall; sheaths long-ciliate in upper part; ligule ciliate; leaf blades narrowly linear, ciliate on the margins, scabrous. Spikes narrowly lanceolate, 2–3 cm long (excluding awns), 0.5–0.7 cm broad; spikelets 2, rarely 3; the lowest joint of the rachis as long as the lowest spikelet, this 4-flowered, with 2 perfect florets; terminal spikelet narrower and shorter, 3–4-flowered, with 1 perfect floret, rarely with 2 perfect florets; glumes in lower spikelets 0.8–1 cm long, 0.5–0.6 cm broad, with 2 flat, dilated awns to 3.5 cm long, and 7–8 arcuate, scabrous nerves; glumes of uppermost spikelet with 3 still broader and longer, readily deciduous awns; lemmas as long as the glumes, short-awned, bearing a single median awn and 2 teeth; caryopsis free. May. (Plate XLVIII, Figure 5).

674 Dry slopes. — European part: Crimea; Caucasus: Dag., East. Transcauc. Gen. Distr.: West. Medit., Balk.-As. Min., Arm.-Kurd. Described from Lesina Island in the Adriatic Sea.

8. *Ae. triaristata* Willd. Sp. pl. IV, 2 (1805) 843; Griseb. in Ldb. Fl. Ross. IV, 327. — *Triticum triaristatum* Gren. et Godr. Fl. Franc. III, 2 (1856) 602. — *T. ovatum* β *triaristatum* Schmalh. Fl. II (1897) 662. — Ic.: Scheuchzer Agrost. (1717) tab. I, fig. 2. — Exs.: HFR No 384.

Annual. Culms 25–35 cm tall, subgeniculate at the base; leaves sparsely covered with long hairs. Spikes lanceolate, abruptly narrowed at the top, 2.3–3.3 cm long (excluding awns), 0.6–0.8 cm broad; spikelets 3–4 (5), the 2 lower ones elliptical, perfect, the uppermost small, neuter; rudimentary spikelets 3–2; glumes 0.8–1.1 cm long, hairy on the nerves, more rarely scabrous, 7–9-nerved, in the lowest spikelet one glume 3-awned, the awns flattened and enlarged at the base, in the uppermost spikelets the glumes usually 3-awned; awns 3.5–5.5 cm long; lemmas 2-awned (one of the awns shorter than the other) and 1-toothed, in the uppermost spikelets 1-awned and 2-toothed; caryopsis free. May–June. (Plate XLVIII, Figure 6, a–c).

Dry and stony slopes. — European part: Prichern., Crimea; Caucasus: Dag., West., South., and East. Transcauc. Gen. Distr.: West. Medit., Balk. — As. Min., Arm. — Kurd. Described from southern Europe. Type in Berlin.

9. *Ae. ovata* L. Sp. pl. (1753) 1050; Griseb. in Ldb. Fl. Ross. IV, 327. — *Triticum ovatum* Respal in Ann. soc. nat., ser. 1, V (1825) 435; Shmal'g. Fl. II, 662. — Ic.: Host, Gram. Austr. II (1802) tab. 5.

Annual. Culms (7) 10–20 cm tall, numerous, geniculate, ascending, densely leafy below; leaves 1.5–3.5 cm long, rather scantily covered with long hairs. Spikes broadly oval, or narrowly elliptical, 1–2.2 cm long (excluding awns), 0.4–0.5 cm broad; number of rudimentary spikelets at the base of the spike 1, rarely 2; spikelets 2–3 (4), ovate or elongate-ovate, ventricose in lower part; the uppermost spikelet (sometimes 2 upper spikelets) slender, sterile; lower spikelets 3–4-flowered, the upper 2-flowered; glumes 0.6–0.8 cm long, 0.5–0.6 cm broad, with broad, arcuate, scabrous nerves, produced into dilated awns; glumes of lower spikelets 4-awned, the awns 1–2 (2.5) cm long, in uppermost spikelets 3–5-awned; lemmas awned (awns 2–3, shorter than those of the glumes), slightly hairy above; caryopsis free. May–June. (Plate XLVIII, Figure 7, a, b).

Dry slopes. — European part: Crimea. Gen. Distr.: West. Medit., Balk. — As. Min., East. Medit. Described from southern Europe. Type in London.

Spikelets solitary, sessile, 3–5-flowered; 1–3 lower florets perfect, upper florets neuter. Glumes coriaceous, more rarely membranaceous, many-nerved, with a prominent, often crested keel, smooth or very scabrous on the keel, glabrous or hairy, elliptical, ovate or oblong, ventricose unequal at the two sides, obliquely truncate at the tip and 1–2-toothed, the tooth sometimes extending into a rather long awn. Lemmas keeled, somewhat ventricose, awned or awnless nerves not connivent at the tip. Lodicules

* Old Latin name for wheat.

ciliate on the margins. Caryopsis rather plump, slightly hairy on the top, oval or oblong, deeply furrowed. Spring or winter plants.

1. Glumes very large, 3-3.5 cm long, membranaceous, thin, broadly lanceolate, longer than the lemmas or as long, with a small curved or a straight point at the tip *T. polonicum* L.
- + Glumes considerably smaller, coriaceous, stiff, ovate or lanceolate, less to slightly more than 1 cm long, 1- or 2-toothed at the tip or awned 2.
2. Spike brittle, readily disarticulating in maturity between the spikelets, the grains remaining firmly enclosed within the lemma and palea . . . 3.
- + Spike pliant, with a continuous rachis, not disarticulating in maturity between the spikelets; grains easily separating from the lemma and palea 10.
3. Spikelets usually with 1 perfect floret; awn of the second, sterile floret very short, rarely approaching the length of the fertile floret. Palea readily splitting into two parts in maturity. 4.
- + Spikelets with 2 fertile florets, usually bearing 2 long awns (rarely awnless). Palea not splitting into two parts in maturity 5.
4. Internodes of rachis densely covered on the angles with long, white hairs; dense tufts of white hairs present at the base of each spikelet. Spikes very brittle, 0.5-0.6 cm broad *I. T. Thaoudar* Reut.
- + Internodes of rachis glabrous or glabrescent; tuft of white hairs at the base of each spikelet lacking or obsolete. Spike not very brittle, 0.6-0.8 cm broad * *T. monococcum* L.
5. Rachis internodes adhering to spikelets at disarticulation, contiguous with them and attached at the lower end, i. e. not forming an extension of spikelet. Spikes loose, slender * *T. spelta* L.
- + Rachis internodes joined to the spikelet at disarticulation, the upper end of the joint being attached on the lower part of the spikelet, so that the joint forms an extension of the spikelet. Spikes dense, laterally compressed 6.
6. The tooth representing the extension of the keel curved away from the terminal notch. 7.
- + The tooth representing the extension of the keel very short, indistinct and very blunt or long and pointed, but more or less curved hookwise toward the notch, more rarely straight 8.
7. Spikes 0.7 cm broad, rachis joints (3) 4-5 mm long
- 2. *T. dicoccoides* (Korn.) Aaronsohn.
- + Spikes (1) 1.2-1.5 cm broad, rachis joints 1.5-2.75 mm long
- * *T. Timofeevii* Zhuk.
8. Glumes 10-11 mm long, the tooth produced from the keel long and acute, curved hookwise toward the notch or straight. Rachilla joints perfectly glabrous, ca. 3-3.5 mm long 9.
- + Glumes 8-9 mm long, the tooth produced from the keel very short, rather indistinct and subobtus. Rachilla joints glabrous on the angles, ca. 2 mm long, with a tuft of few hairs at the base of each spikelet
- * *T. volgensis* Nevski.
9. Rachilla joints 3.5 mm long, with dense white hairs on the angles
- * *T. macha* Dekarp. et Menabde.
- + Rachilla joints ca. 3 mm long, entirely glabrous
- * *T. armeniacum* Nevski.

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10. Glumes with a prominent, crested keel reaching down to the base and excurrent at the tip in sharp tooth, awnless. The base of glumes devoid of concavity. Lemmas nearly always long-awned 11.
- + Glumes faintly keeled, especially in lower part, where the keel disappears or is almost imperceptible, whereas at the tip it is excurrent in a tooth or awn. The base of glumes, just above the point of insertion on the rachilla, mostly slightly concave. Lemmas long-awned or awnless 12.
11. Glumes considerably shorter (ca. by 1/3 their length) than the lowest floret. Spikes usually square in cross section, plump, very dense * *T. turgidum* L.
- 677 + Glumes nearly as long as the lowest floret. Spikes usually not square in cross section, laterally compressed, slender * *T. durum* Desf.
12. Spikes very dense, short, plump, their length at most 3-4 times their width * *T. compactum* Host.
- + Spikes long, loose or dense; their length amounting to 7.5-10 times their width 13.
13. The keel of glumes excurrent in an awn 10-30 mm long. Lemmas long-awned. Awns parallel to the spike . . . * *T. cartholicum* Nevski.
- + The keel of glumes excurrent in a tooth or awn-point. Lemmas awnless or long-awned; awns usually spreading * *T. aestivum* L.

Section 1. *Crithodium* Nevski; Link in *Linnaea* IX (1835) 132, pro gen. - *Monococca* Flaksberger in *Annals of the state inst. of experimental agron.* VI, 2 (1928) 39.

Spikelets 2-flowered or 3-flowered, only the lowest floret perfect, long-awned, the second floret neuter and usually short-awned, rarely perfect, the third, uppermost floret, rudimentary. Palea slightly splitting at maturity into 2 lobes.

1. *T. Thaoudar* Reut. in *Bourg. P. exs.* 1860 No 261, nomen; Boiss. *Fl. Or.* V (1884), 673, nomen; Hausskn. in *Mitt. d. Thuring. bot. Ver.* N. F. B. XIII, XIV (1899), diagn. - *T. monococcum* β *lasiorrhachis* Boiss. l.c., pro parte.

Annual. Culms 40-90 cm tall, slender, with hairy nodes; leaves narrowly linear, covered with long hairs on the upper surface and below on the lower surface, to 6 mm broad, flat or with rather inrolled margins; lower sheaths hairy, the upper ones glabrous. Spikes 4-6 cm long (excluding awns) and 0.5-0.6 mm broad, with a very brittle rachis; rachis internodes densely covered on the angles with long white hairs, 2.5-2.75 (3) mm long; spikelets 2-flowered, only the lower floret perfect; awn scabrous, (3) 5.5-9.5 cm long (awn of fertile floret in lower spikelets shorter than in intermediate and upper spikelets of the spike); second floret neuter, its lemma terminating in a shorter awn, not exceeding 0.3-2.5 cm, more rarely 4-5 cm long, rarely exceeding half the length of the awn of the fertile floret, only in the case of the Kurdistan race slightly shorter than the awn of the fertile floret; glumes 0.75-0.83 cm long, 2-keeled, one of the keels more prominent, scabrous above, extending into an acute triangular tooth 1.5-2 mm long; the other, less prominent nerve, 678 prolonged at the tip into a smaller, acute tooth, 0.5 mm long; hence glumes

sharply notched, bidentate at the tip, space between the keels flat and usually smooth (distance between the keels 1.75-2 mm). June. (Plate XLVIII, Figure 8, a, b).

Slopes of hills, roadsides, field margins, abandoned fields. -European part: Crimea; Caucasus: South. Transcauc. Gen. Distr.: Asia Minor. Described from Elmalıu hills in the south of Asia Minor. Type in Geneva, cotype in Leningrad.

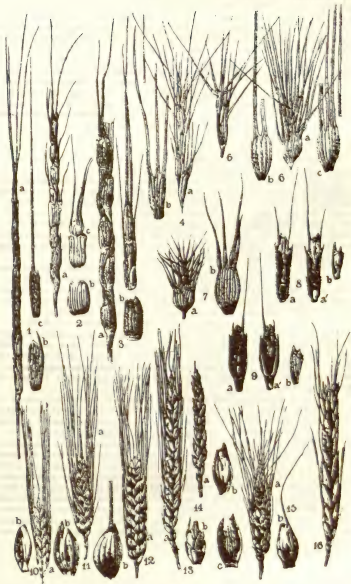
NOTE. The wild Crimean one-grained wheat is likely to attain in the future an independent standing as a species. Morphologically it resembles much more closely the typical *T. Thaoudar* of Asia Minor than the Greek *T. aegilopoides* (Link) Balansa (Pl. exs. ann. 1854; *Crithodium aegilopoides* Link in Linnaea, l.c.), to which it is referred by K. Flaksberger. The essential difference between *T. Thaoudar* and *T. aegilopoides* consists not so much in the length of awn and fertility of the second floret as in the size of the glumes, these being much smaller in *T. aegilopoides*, not exceeding 6.65 mm in length (in specimens from southern Yugoslavia 7-7.5 mm long), with keels 1.5 mm apart.

The first approach to the description of *T. Thaoudar* was made by Boissier, and a cotype of this species is preserved in the BIN herbarium of the Academy of Sciences, which bears a note in Boissier's own handwriting: "*Triticum Thaoudar* n. sp. Boiss.". I do not know why the name of this species has later been associate in the literature with that of Reuter. The authentic specimen of *T. Thaoudar* resembles very closely the wild Crimean one-grained wheat; the second florets of its spikelets are short, not exceeding 7-13 mm (in the Crimean one-grained wheat the awns of the second (neuter) florets are often considerably longer (up to 40-50 mm), but glumes are very slightly larger, 8-9 mm long. Only later on Haussknecht connected the name *T. Thaoudar* with a more easterly Asia Minor race, in which the awn of the second floret is only slightly shorter than that of the perfect floret. It should be mentioned that specimens of wild one-grained wheat from the Balkan Peninsula are also variable and the south-Serbian form is morphologically distinct from the Thessalian, and comes close to the Crimean. Apparently, at least 5 geographical races are to be distinguished within the aggregate species *T. aegilopoides* auct.

681 * *T. monococcum* L. Sp. pl. (1753) 86, -lc.: Flaksberger, *Opređelite' nastoyashchikh khlebov* (Key to Present-Day Cereals) (1923), Figure 1.

Explanation to Plate XLVIII

1. *Aegilops cylindrica* Host: a) spike; b) glume or lower spikelets; c) glume of uppermost spikelet. -
2. *Ae. squarrosa* L.: a) spike; b) glume; c) spikelet. -3. *Ae. crassa* Boiss.: a) spike; b) glume. -
4. *Ae. triuncialis* L.: a) spike; b) glume. -5. *Ae. biuncialis* Vis. -6. *Ae. triaristata* Willd.: a) spike; b) and c) glume. -7. *Ae. ovata* L.: a) spike; b) glume. -8. *Triticum Thaoudar* Reut.: a) and a') joints of spike with spikelets; b) glume. -9. *T. monococcum* L.: a) and a') joints of spike with spikelets; b) glume. -10. *T. volgaeense* (Flaksh.) Nevski: a) spike; b) glume. -11. *T. durum* Desf.: a) spike; b) glume. -12. *T. turgidum* L.: a) spike; b) lemma. -13. *T. spelta* L.: a) spike; b) a joint of spike with spikelet; c) glume. -14. *T. aestivum* L.: a) spike; b) glume. -15. *T. compactum* Host: a) spike; b) lemma. -16. *T. polonicum* L. Drawings of *Triticum* species after Flaksberger.



Annual. A light green plant, with slender culms, 100-125 cm tall, short-pubescent at the nodes; leaves broadly linear, to 1 cm broad, scabrous, glabrous, or the lower ones short-pubescent on the upper surface. Spikes strongly compressed laterally, (2.5) 3-6 cm long (excluding awns), glabrous, more rarely pubescent; rachis internodes ca. 2 mm long, sparsely short-pubescent on the angles, each joint forming an extension of a spikelet, to which it is attached by its upper end; glumes 0.6-0.8 (0.9) cm long, lanceolate or subobovate, slightly shorter than the lower floret, usually glabrous and lustrous, 2-keeled, one of the keels prominent, scabrous above, and prolonged into an acute, triangular tooth 0.75-1.5 mm long, the other keel less prominent, prolonged at the tip into a much smaller, subacute tooth, hence the glume bidentate, sharply notched; glumes between the keels flat or nearly so, obscurely nerved, broadly scarious-margined; lemmas bearing a very scabrous awn, usually 5-6.5 cm long. June-July. (Plate XLVIII, Figure 9, a, b).

European part: Crimea; Caucasus. Described from cultivated specimens, apparently of European origin. Type in London.

ECONOMIC IMPORTANCE. According to N. Drozdov, one-grained wheat is cultivated to the present day in Crimea, although very rarely (the village Baidary on the south coast and the village Kayash-Bodrak in the former Simferopol rural district). However, according to E. Barulina's report, one-grained wheat occurs in Crimea only as admixture in stands of other wheat species, being a weed. Known in the U.S.S.R. as a plant cultivated by the Chechenians. The flour of one-grained wheat is unsuitable for baking, as it produces excessively crumbling bread.

Section 2. *Orthatherum* Nevski. - *Dicoccoidea** Flaksberger in Annals of the state inst. of experim. agron. VI, 2 (1928) 39. - Spikelets 3-5-flowered, with 2-3 (4) fertile florets. Glumes with prominent crested keel, distinct down to the base. Palea not split into 2 lobes at maturity. Spikes awned (rarely awnless), the awns parallel or slightly spreading.

2. *T. dicoccoides* (Körn.) Aaronsohn in Verhandl. d. K. K. Zool. bot. Gesel. Wien LIX (1910) 491; A. Schulz in Zeitschr. f. Naturwissenschaften, Bd. 84 (1913) 414 et in Ber. d. Deutsch. Bot. Ges. Berlin XXXI (1913) 226. - *T. vulgare* var. *dicoccoides* Körnicke in Niederrh. Ges. Bonn. (1889) 21. - Ic.: M. Yakubtsinev, Nakhozhdenie dikoi pshenitsy v SSSR (The occurrence of wild wheat in the U.S.S.R.), "Priroda" ("Nature") No 8-9, p. 100, fig. 1.

Annual. A glaucous-green plant, 30-100 cm tall; culms puberulent at the nodes; sheaths of lower leaves covered with white retrorse hairs; 682 leaves scabrous on the upper surface, sometimes also underneath, rather hairy. Spikes very brittle, usually 4.5-6 cm long (excluding awns) and 0.7 cm broad; rachis joints densely clothed with long hairs on the angles, (3) 4-5 mm long; spikelets with 2 long-awned florets and a third rudimentary, awnless floret; glumes elliptical-lanceolate or lanceolate, 1-1.2 cm long, with a very prominent keel and 1 keel-like nerve which differs conspicuously from the other, less prominent nerves; keel excurrent in an acute, triangular tooth, 1 mm long, slightly curved away from the terminal notch; the keel-like nerve terminating in another, very short and obtuse tooth; the notch between the teeth sharp and rather narrow; lemmas glabrous, prolonged into a long, very scabrous, straight awn, (9) 10-15 cm

* Only a substitutive can serve as a section name.

long, the awn of the lower floret being slightly longer than that of the upper floret. June.

Dry mountain slopes, between 1,200 and 1,700 m alt., on brown serozems with salt efflorescence on the surface. -Caucasus: South. Transcauc. Gen. Distr.: Syria, Palestine, Persia, Cilician Taurus. Described from Palestine.

NOTE. Wild two-grained wheat of Transcaucasia differs from the Palestinina, and is recorded by M. Yakubtsinev as a distinct subspecies, *T. dicoccoides* ssp. *armeniacum* Jacobz.

* *T. Timofeevii* Zhuk. in Bull. of Appl. Bot., Genet. and Plant-Breed. XIX, 2 (1928) 64, fig. 1-3. -*T. dicoccum dicoccoides* Körn. var. *Timofeevii* Zhuk. in Scientific Papers of the applied sections of the Tiflis Botanical Garden (1923) No 3.

Annual. A plant clothed with stiff hairs; leaf sheaths covered with hairs to 3 mm long; leaf blades also hairy. Spikes flat (width greatly exceeding thickness), very compact, 3-6.5 (8.5) cm long (excluding awns) and (1) 1.2-1.5 cm broad, hairy, brittle in maturity, but not readily disarticulating between the spikelets; rachis internodes 1.5-2.75 mm long, rather densely clothed with white hairs on the angles. Spikelets 3-flowered, the uppermost floret reduced; glumes 1.5-2 mm shorter than the lower florets, elliptical-broadly-lanceolate, densely covered with white, subappressed hairs, the keel very prominent, excurrent in a straight, narrow, triangular, pointed tooth, 1-2.25 mm long, slightly curved away from the terminal notch or nearly straight; nerves of the glumes rather prominent, the most prominent one prolonged into a second, very short and slight, obtuse, triangular tooth, 1-1.5 mm distant from the keel; the notch between the 2 teeth small and narrow; glumes (0.9) 1-1.1 cm long; lemma of the 2 fertile florets 1.1 cm long, hairy, with a straight awn (3.5) 5-8.5 (10) cm long.

Caucasus: East. Transcauc. Endemic. Described from Azarma area (Upper Kartaliniya). Type in Leningrad.

- 683 NOTE. P. M. Zhukovskii regards his species as a field weed and assumes that this two-grained wheat is gradually dying out in Central Transcaucasia, while entering into semi-cultivated use (it is often seeded in proximity of farmsteads to provide feed for poultry). E. Stoletova, having at her disposal samples obtained from former Kutanskaya Province, concluded that this plant is a cultivated form of *T. dicoccum*.

* *T. armeniacum* (Stolet.) Nevski comb. nova. -*T. dicoccum* var. *farrum* f. *armeniaca* Stoletova in Bull. of Applied Bot. and Plant-Breed. XIV (1925) 91, tab. IV (p. 95). -*T. dicoccum* auct. fl. cauc., pro max. parte, non Schübl.

Annual. Seedlings anthocyanin-tinged or green; culms 85-100 cm tall, 2.5-3.5 mm in diameter, hollow, with thin walls, tinged with anthocyanin in maturity; nodes copiously pubescent; leaf sheaths densely pubescent; leaves velutinous-tomentose. Spikes flat, pruinose, 5.5-6.5 cm long (excluding awns); rachis internodes entirely glabrous, ca. 3 mm long; spikelets 3-flowered, the uppermost floret neuter; glumes 10-11 mm long, broadly lanceolate, with a prominent keel, concave below the tooth and hispid on the upper 1/3 of its length; the tooth projecting from the keel broad, long, subacute, hooked, or straight, shorter, and then acute; the notch between this and the second, rather indistinct tooth, usually deep and narrow; nerves of the glume prominent, the nerve terminating in the tooth

fairly conspicuous; awns of lemmas 10 cm long or somewhat longer; caryopsis broad, oval. Cultivated, -Caucasus: East. Transcauc. Endemic. Described from the former Tiflis Guberniya. Type in Leningrad.

NOTE. As regards glume shape, closer to European *T. dicoccum* (Schrank) Schubl. than to *T. volgense* Nevski, and was associated by P. M. Zhukovskii with European Emmer wheat. Differs from *T. dicoccum* in shorter keel-tooth of the glume, strongly pubescent culm nodes, and formation of anthocyanin in culms and auricles.

* *T. volgense* (Flaksberg.) Nevski comb. nova, -*T. dicoccum* var. *farrum* f. *volgense* Flaksberg. Opredelitel' nastoyashchikh khlebov (Key to Present-Day Cereals) (1923) 24. -*T. dicoccum* auct. fl. ross., partim, non Schubl., -lc.: Bull. of Appl. Bot. and Plant-Breed. XIV (1925) 94, tab. III.

Annual. Seedlings tinged with anthocyanin; culms 80-100 cm tall, 2-2.5 mm in diameter, with rather pubescent nodes, hollow, thin-walled, anthocyanin-tinged in maturity; leaves 7-10 mm broad, rather glaucous, covered on both sides with long, thin, interwoven hairs. Spikes flat, 5.5-6.5 cm long (excluding awns), very compact, pruinose, containing 15-19 spikelets; rachis brittle, rachis internodes ca. 2 mm long, without pubescence on the angles, with a tuft of hairs only at the base; spikelets 3-flowered, the uppermost floret reduced; glumes 8-9 mm long, broadly lanceolate, the keel prominent, slightly concave below the tooth, with very few, indistinct prickles near the tip; the keel-tooth very short, inconspicuous; subsidiary tooth even less distinct, obtuse; the notch between the 2 teeth broad, shallow; nerves of glume fairly distinct, the nerve terminating in the subsidiary tooth rather inconspicuous; lemmas long-awned; caryopsis elongate, much compressed laterally, angular in cross section. (Plate XLVIII, Figure 10, a, b).

Cultivation of this wheat concentrates about the middle course of the Volga and the lower reaches of river Kama. -European part: Volg. -Kam., Zavolz., Volg. -Don., (northern part of the region). Endemic. Described from the Volga-Kama region. Type in Leningrad.

NOTE. Apart from many other characters, it differs strikingly from west-European *T. dicoccum* in the size and, even more so, in the shape of glumes, the tooth extending from the keel not being large and curved toward the notch as in European Emmer wheat. According to E. Stoletova (see her paper "Polba-emmer *T. dicoccum* Schrank" in Bull. of Appl. Bot. and Pl. -Breed. XIV (1925), p. 27), the first to draw attention to the distinctiveness of the Volga wheat from *T. dicoccum* was Professor Batalin, who wrote in his study "Russkie sorta polby" (Russian varieties of Emmer-type wheats) that "in German specimens the keel-tooth of the glumes is always long, pointed, ciliate, and curved to such an extent that it covers the smaller second tooth which is situated close to it, while in the Russian plants the keel-tooth is almost perfectly straight, subobtuse, and sometimes does not cover the second tooth, the latter being, moreover, more distant from the keel-tooth, always very blunt, often scarcely projecting beyond the summit of the glume, and hence the glume as a whole, even though narrowed toward the summit, is not pointed (as in the German plants), but considerably blunted".

* *T. turgidum* L. Sp. pl. (1753) 86.

Annual. Culms 80-120 cm tall, rather stout, very hard, almost entirely filled with pith or possessing a lumen; leaves broadly linear, hairy or

glabrous. Spikes plump, usually square in cross section, very dense, pubescent or glabrous; rachis internodes hairy on the angles and below the spikelets; rachis not brittle; glumes broadly ovate, inflated, 9-10 mm long (length slightly exceeding the width) considerably shorter by ca. 1/3 of its length than the lemmas, with a very prominent, crested keel, excurrent in a triangular, acute tooth; keel very rough owing to prickles, these small in upper part and resembling cilia in lower part; lemmas usually ventricose and awned; awns ca. 12 cm long, parallel; caryopsis mostly short and plump. (Plate XLVIII, Figure 12, a, b).

685 Cultivated in small quantity in Transcaucasus and Central Asia. -Caucasus: East, and South. Transcauc. (eastern part of the region); Centr. Asia: southern Kazakhstan.* Cultivation of this wheat is widespread in southern Europe. Probably described from specimens of south-European origin.

T. durum Desf. Fl. Atlant. I (1800) 114.

Annual. Culms 100-180 cm tall, rigid, solid, rarely somewhat hollow; leaves broadly linear, glabrous, more rarely covered with short hairs on the upper surface. Spikes regular, laterally compressed (not square in cross section), dense, plump. Rachis not brittle; spikelets 5-flowered, perfect florets 3-4; glumes nearly as long as the lemmas, ovate, 1-1.2 cm long, the keel prominent, crested, excurrent in a triangular-subulate tooth (1) 1.5-2.5 mm long; keel very rough with small prickles; one of the nerves rather conspicuous and terminating in a tooth-like, obtuse point, situated close to the keel-tooth. Lemmas laterally compressed, with a very long (to 12-15 cm, sometimes even to 19 cm), stout awn; only lemmas of the 2 lower florets awned, lemmas of upper florets awnless or terminating in an awn-point. Palea as long as the lemma; caryopsis usually hard, vitreous (Plate XLVIII, Figure 11, a, b).

Next to *T. aestivum* L., this wheat species is most widespread in cultivation in the U.S.S.R. (mainly known under the names Kubanka and Beloturka). -European part: cultivated in the east and southeast; Caucasus; Ciscauc. and Transcauc.; West. Siberia: all regions; Centr. Asia: all regions, infrequently. The principle centers of cultivation are situated in this country in the Lower Don region, in the German Republic of Povolzhe and in the Orsk area. *T. durum* in this country is a wheat of steppe type, and the northern limit of its cultivation runs south of Kiev and Chernigov towards Kursk and Voronezh, thence through Tambov, Ul'yanovsk, Sarapul, Kungur, and Tyumen', to the south of Tobol'sk, and through Barabinsk and Novosibirsk, to Krasnoyarsk and Minusinsk. *T. durum* is cultivated relatively rarely in the Central Asian republics. Described from North Africa. Type in Paris, cotype in Leningrad.

Durum wheat produces the best sorts of grainy flour and semolina. It also serves for production of best kinds of macaroni.

* *T. carthlicum* Nevski nomen novum. -*T. persicum* Vav. in Ann. de l'Acad. Petrovsk. (1919) 1-4 p. 177, nomen nudum; P. Zhukovsky in Bull. of Appl. Bot. and Plant-Breed. XIII (1923) 46, tab. IX-XII, non *Triticum persicum* Aitch. et Hemsl. in Trans. Linn. Soc. Ser. II, 3 (1886) 127.

686 Annual. Culms not hollow, entirely filled or with a small lumen, very slender below the spike; nodes of the culm hairy; leaves flat, hairy. Spikes 8-15 cm long and 0.8-0.9 cm broad, more or less square in cross section; the lateral side of the spike spreading in one plane (not wavy); rachis very

* [Now Kazakhstan.]

slender; glumes lanceolate, smooth, 0.7-0.9 cm long, pointed and awned, with a narrow slit at the summit, prominently keeled; awns of glumes slightly curved, very scabrous, to 1-3 cm long, awn of the lower glume shorter than that of the upper glume; awns of lemmas ca. 10 cm long, parallel; caryopsis hard, vitreous.

Cultivated. -Caucasus: East. and South, Transcauc., whence described. Type in Leningrad.

Section 3. *Spelta* Nevski. -*Speltoidea* Falksberg. in Annals of the State inst. of experim. agron. VI, 2 (1928) 39. -Spikelets 3-5-flowered, usually with 2 perfect florets. Glumes rather faintly keeled, the keel almost disappearing toward the base and distinct only in upper part, more rarely keel strongly developed (in *Triticum macha* Dekapr. et Menabde). Palea not divided into 2 lobes in maturity. Spikes awnless or awned; awns usually divergent.

* *T. macha* Dekapr. et Menabde, Bull. of Applied Botany, Genetics and Plant-Breeding, Series 5, I (1933) 14.

Annual. Culms hollow, ca. 100 cm tall; leaves glabrous (scabrous) or very sparsely hairy. Spikes very dense, (8) 10-12.5 cm long (excluding awns) and 0.8-1 (1.2) cm broad, brittle, the rachis joints usually remaining attached to spikelets by their upper end, rarely attached to spikelet base by the lower end, as in *T. spelta*; rachis joints densely clothed on the angles (especially in upper part) with long white hairs, the joints 3-5 mm long and broader than in *T. dicoccum* (2.5-3 mm); glumes broadly elliptical-lanceolate, the keel prominent right down to the base, densely covered with semi-appressed white hairs, more rarely glabrous, scabrous on the keel, (0.9) 1-1.1 cm long, bidentate at the tip, 1-2 mm shorter than the lemmas, the keel-tooth 1-2 (2.75) mm long, falcately bent toward the notch, the subsidiary tooth very blunt and short, broadly triangular; lemmas pubescent, rarely glabrous, ca. 1.1 cm long, excurrent in a straight or very slightly flexuous, very scabrous awn, (2.5) 4-6.5 cm long; spikelets 3-4-flowered, perfect florets 2, more rarely 3; caryopsis semi-vitreous, often dorsally wrinkled.

Caucasus: West. Transcauc. (West. Georgia-planted almost exclusively in Lechkhum, and even there only in some villages). Endemic.

NOTE. This species is very interesting from the point of view of systematics, as it represents a link connecting between the group of wheats with 687 42 chromosomes (*T. spelta*, *T. aestivum*, etc.) and the cultivated two-grain wheats. -As regards morphology, it resembles more closely species of the *T. dicoccum* Schübl. group. Only the chromosomal count of 42 and the occasional occurrence, in some specimens, of a brittle spike of the spelt type, ensure distinction from *T. dicoccum*.

* *T. spelta* L. Sp. pl., ed. 1. (1753) 86, p. pte.

Annual. Culms hollow, to 120 cm tall, glabrous and smooth; leaves flat, broadly linear, glabrous, more rarely covered with scattered hairs. Spikes slender and very loose, to 15 cm long, more or less square in cross section, brittle at maturity, rachis joints remaining attached after disarticulation to the back of the spikelet by the lower end; spikelets 5-flowered, only the 2 lower florets perfect; glumes broadly rhomboidal-ovate, the faint keel excurrent at the tip in a short tooth, this accompanied on the outer side of the glume by a subsidiary smaller, blunt tooth; lemmas ovate, long-awned or terminating in a short awn-point; palea as long as the lemma;

caryopsis laterally compressed, narrowly furrowed. (Plate XLVIII, Figure 13, a, c).

Not cultivated at all in the U.S.S.R., but occurring in old herbaria (for instance that of Chernyaev; it was grown in botanical gardens). Described from Europe. Type in London.

* *T. compactum* Host, Gram. Austr. IV (1809) 4, tab. 7.

Annual. Culms hollow, glabrous, 60-90 cm tall; leaves flat, linear, slightly hairy. Spikes compact, plump, very dense, 3-4.5 cm long (excluding awns) and 1.2-1.8 cm broad, the length not more than 3-4 times the width; spikes square in cross section or nearly so, slightly compressed; spikelets compactly 4-5-flowered (upper florets neuter); glumes resembling those of *T. aestivum* L., broadly ovate, 0.6-0.7 cm long (as measured without keel-tooth or awn), keel not prominent, prolonged into an awn-pointed or a fairly long awn; lemmas ovate, awns divergent; caryopsis smaller than in *T. aestivum*, 5.5-6 mm long. (Plate XLVIII, Figure 15, a, b).

Cultivated in limited quantity in Central Asia (Tadzhikistan, Amu-Dar'ya plains, Tyan'-Shan' region) and Transcaucasia; not cultivated in the European part of the U.S.S.R., and occurs here only in mixture with other species. Described from Styria. Type in Vienna.

* *T. aestivum* L. Sp. pl. (1753) 85. -*T. hybernum* L., l.c., p. 86. -*T. vulgare* Vill. Hist. pl. Dauph. II (1787) 153.

688 Annual. Culms hollow, with glabrous nodes; leaves flat, usually glabrous nodes; leaves flat, usually glabrous. Spikes linear, long, loose or dense, square or nearly so in cross section, usually narrowed upward, not brittle; spikelets 4-5-flowered (upper florets neuter), awnless or awned; glumes ovate, keel not prominent in upper part, indistinct and almost disappearing in lower part, prolonged at the tip into a tooth, this rather short, subobtusate, pointed, or tapering into a short, aristate point; lemmas awnless or long-awned, awns usually divergent; caryopsis obscurely or slightly compressed, farinaceous or vitreous. (Plate XLVIII, Figure 14, a, b).

The most widely cultivated wheat species; mostly awnless forms are grown in the European part of the U.S.S.R., but awned races of soft wheat predominate in cultivation in Central Asia.

The cultivation of *T. aestivum* centers largely in the steppe and forest-steppe zones of the U.S.S.R., but it is also grown much farther to the north, and thus the northern limit of spring-wheat cultivation runs from Leningrad and the southern border of Ladoga Lake, through the upper course of Onega, middle reaches of Vaga, and Vychegda lowland, to upper Kama. In Siberia this limit approaches the northern cultivation limit.

Section 4. *Gigachilon** Nevski; Seidl. in Berchtold und Seidl., Oek. -techn. Fl. Böh. I (1836) 425, pro gen., nomen. -Glumes membranaceous (resembling in consistency those of oats), very large, to 3-3.5 cm long.

* *T. polonicum* L. Sp. pl. ed. II (1762) 112.

Culms 100-150 cm tall, few, glabrous and smooth, solid or hollow; leaves broadly linear, to 2 cm broad, glabrous or pubescent. Spikes linear, square or rather compressed in cross section, rather dense, not disarticulating in maturity between the spikelets; spikelets containing 2-3

* From the Greek words *gigas*-large, and *chilos*-lip, alluding to the exceptionally large glumes.

perfect florets and 1 neuter floret; rachis densely hairy on the angles or glabrescent, with conspicuous callosities at the base of spikelets, such as are absent in other wheats; glumes broadly lanceolate, with numerous distinct nerves and a keel excurrent in a slightly curved point; glumes usually slightly longer than the lemmas, hairy or glabrous; lemmas lanceolate, with awn 5-15 cm long or awnless; palea of the lowest floret just exceeding half the length of lemma; caryopsis long, resembling in shape that of rye, but larger, semi-translucent. (Plate XLVIII, Figure 16).

Cultivated to a very limited extent in Central Asia (Tyan'-Shan); very rarely grown in the European part of the U.S.S.R. Described probably from specimens of south-European origin. Type in London.

Genus 203. *HETERANTHELIUM** HOCHST.

Hochst. in Kotschy, pl. Alepp. exs., cum descriptione (1843).

Spikes dense. Spikelets solitary, sessile, long-awned, many-flowered, of two kinds—some reduced, consisting of empty awned bracts, and others with 2 lower perfect florets and a terminal neuter floret consisting of a single empty bract. Glumes setiform, long-villous in lower part, slightly divergent. Lemmas of fertile florets coriaceous, the lower part ovate, ventricose, tuberculate and setiferous, the upper part 5-nerved, gradually tapering into a long, straight awn. Palea hyaline, 2-keeled, the keels excurrent in 2 short, aristate points. Caryopsis adnate to the palea, pubescent on the top, deeply furrowed. Annual plants.

1. *H. piliferum* Hochst. in Kotschy, pl. Alepp. exs. (1843). — *Triticum* Olgae Rgl. in A.H.P. VII (1880) 588. — Ic.: Jaub. et Spach, III. Or. IV (1850), tab. 318.

Annual. Culms geniculate-ascending, decumbent, (4) 8-25 (30) cm tall; leaves narrowly linear, flat, scabrous, and often somewhat hairy. Spikes 2.5-7 cm long (including awns), green or purple, very brittle, disarticulating but into segments consisting of several spikelets each and not into separate spikelets; glumes setiform, 1-1.5 cm long; lemmas of fertile florets with awn 2-2.5 cm long. May. (Plate XLVII a, Figure 13, a-c).

Stony and dry submontane slopes in the semi-desert zone. — Caucasus: South, Transcauc.; Centr. Asia: Syr-Dar., Pam.-Al. Gen. Distr.: East, Medit., Arm.-Kurd., Iran. Described from the surroundings of Aleppo. Type in Geneva.

NOTE. The genus *Heteranthelium* is monotypic and occupies an isolated position within the *Hordeae* tribe.

The spike of *Heteranthelium* does not disarticulate between individual spikelets, but breaks up into small fragments, each consisting of 1 or 2 fertile spikelets surmounted by 4 or 3 reduced spikelets. In respect of this feature of disarticulation, *Heteranthelium* resembles remotely the genus *Eremopyrum* Jaub. et Spach, in which the spike breaks up into joints bearing 2 spikelets each; in respect of awn structure it resembles

* From Greek *heteros*—different, and *anthele*—in restricted sense, floret of reed; in more general connotation—compound panicle.

the genus *Aegilops*, and as regards the structure of glumes - the genus *Hordeum*; as far as the characteristically tuberculate lemmas of the perfect florets are concerned, it is quite distinctive.

Hochstetter dubiously includes *Elymus pilifer* Russel among synonyms of *H. piliferum* (Russell, "The Natural History of Aleppo", ed. 2, II (1794) 244.

Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 640.

Spikes nodding or erect, with long-awned spikelets, arranged in twos (rarely threes) on the rachis. Spikelets 3-7-flowered. Glumes with scabrous nerves. Lemmas scabrous, shorter than the rather divergent awns. Lodicules very small, ciliate on the margin or glabrescent. Anthers short, 1/2 or 2/3 the length of lemma and palea. Caryopsis oblong, hairy on the top, almost flat on the inner side. Perennial tufted plants, without creeping rhizomes.

1. Spikes drooping or 1-sided. (Sect. 1. *Euclinelymus* Nevski) . . 2.
- + Spikes erect, cylindrical. (Sect. 2. *Turczaninovia* Nevski) . . . 3.
2. Spikes weak, nodding, 10-24 cm long 1. *C. sibiricus* (L.) Nevski
- + Spikes dense, 1-sided, 5.5-12 cm long 2. *C. nutans* (Griseb.) Nevski.
3. Leaves glabrous, scabrous, to 0.8 cm broad. Lemmas very scabrous 3. *C. dahuricus* (Turcz.) Nevski.
- + Leaves hairy on both surfaces, 1-1.8 cm broad. Lemmas usually almost smooth on the back, scabrous on the sides and above 4. *C. excelsus* (Turcz.) Nevski.

Section 1. *Euclinelymus* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 641. -Spikes weak, drooping or 1-sided. Glumes small, short-awned, shorter than the lowest floret. Anthers very short.

1. *C. sibiricus* (L.) Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 641. -*Elymus sibiricus* L. Sp. pl. (1753) 83; Griseb. in Ldb. Fl. Ross. IV, 330; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 366. -*E. praetervisus* Steud., Syn. pl. gram. (1855) 348. -*E. Krascheninnikovii* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 780. -Exs.: HFR No 541.

Perennial. A glaucous-green plant, often pruinose; culms slightly geniculate at the base, 45-90 cm tall, with dark, blackish nodes; leaves flat, thin, scabrous on both sides, sometimes somewhat hairy on the upper surface, 0.5-1.1 (1.4) cm broad. Spikes drooping, rather dense, 10-24 cm long, with (3)-5-7-flowered, green or greenish-purple spikelets; internodes of the rachis 0.6-1.3 cm long below, 0.35-0.6 cm long above; glumes linear or subulate-linear, 3-nerved, 0.45-0.5 cm long, gradually tapering

* From Greek *cline* - bed, and *elymos*, bed implying the rachilla, strongly developed in species of this genus.

691 into awn 0.1-0.5 cm long; lemmas 0.8-1.1 cm long, lanceolate, 5-nerved, very scabrous, copiously covered with small appressed bristles, prolonged into a scabrous awn, this spreading at a rather obtuse angle, 1.5-2.2 (2.5) cm long, 1.5-2.5 times the length of lemma; palea as long as the lemma, bidentate at the summit, ciliate on the keels; lodicules very scantily ciliate on the margin. June-July. (Plate XLIX, Figure 1, a-e).

Mud flats and dry-valley meadows. -European part: Volg.-Kam.; West. Siberia: Upp. Tob., Ob., Alt., Irt.; East. Siberia: Ang. Sayan., Daur., Len.-Kol., Far East: Ze.-Bur., Ussur., Ud., Okhot., Kamch.; Centr. Asia: Dzung.-Tarb., Tyan'-Shan, Pam.-Al. Gen. Distr.: Dzung. -Kashg., Jap.-Chin., Mong. Described from Siberia. Type in London.

ECONOMIC IMPORTANCE. According to the evaluation of the Omsk Regional station, this is a forage grass of medium quality; according to Beguchev - of very high nutritive value. Recommended for cultivation in Chernozem steppes.

2. *C. nutans* (Griseb.) Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 644. -*Elymus nutans* Griseb. Goett. Nachr. (1868) 72.

Perennial. A glaucous plant; culms erect or slightly curved at the base, (15) 35-75 cm tall; leaves flat, glaucous-green, scabrous on both surfaces, glabrous or minutely pubescent on the upper side, with rather thick veins, 0.3-0.7 cm broad. Spikes dense, 1-sided, often contorted, somewhat nodding, 5.5-12 cm long; spikelets greenish-purple, subsessile, often pruinose, 3-5-flowered, internodes of the spike 0.3-1 cm long below, 0.2-0.4 cm long above; glumes subulate-linear, 0.35-0.5 cm long, with awn 0.1-0.2 cm long; lemmas 0.7-1 cm long, the rather spreading awn 1.4-2 cm long, 1 1/2-2 times the length of lemma; palea nearly as long as the lemma, bidentate at the summit; lodicules ciliolate at the top. July. (Plate XLIX, Figure 2 a-d).

Mountain meadows. -Centr. Asia: Dzung.-Tarb., Tyan'-Shan., Pam.-Al. Gen. Distr.: Ind.-Him., Dzung.-Kashg., Mong. Described from the Himalayas.

Section 2. *Turczaninovia* Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 645. -Spikes erect, cylindrical; glumes large, linear-lanceolate, as long as the lowest floret, or nearly so.

3. *C. dahuricus* (Turcz.) Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 645. -*Elymus dahuricus* Turcz. Bull. Soc. Nat. Mosc. XXIX, 1 (1856) 61; Griseb. in Ldb. Fl. Ross. IV (1853) 331; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II (1929) 368.

692 Perennial. Culms numerous, erect, 60-140 cm tall; leaves scabrous on both surfaces, glabrous, somewhat glaucous-green, to 0.8 cm broad. Spikes erect, dense, 9-18 cm long, with subremote spikelets near the base; spikelets green or greenish-purple, 3-4-flowered; glumes lanceolate or linear-lanceolate, gradually pointed, 0.7-1 cm long, with awn 0.1-0.3 cm long, 3-5-nerved; lemmas 5-nerved, 0.7-0.9 cm long, scabrous, prolonged into a rather spreading awn 1.3 cm long; palea subobtusate, ciliate on the keels; lodicules ciliate on the margin. July. (Plate XLIX, Figure 3, a-e).

Meadows in mountain-river valleys. -Centr. Asia: Pam.-Al., Tyan'-Shan., Dzung.-Tarb.; West. Siberia: Alt.; East. Siberia: Ang.-Sayan., Daur.; Far East: Ze.-Bur., Ud., Ussur, Gen. Distr.: Jap.-Chin.; Mong., Dzung.-Kashg., Iran. Described from the surroundings of Kharattsai in Transbaikalia. Type in Khar'kov.

4. *C. excelsus* (Turcz.) Nevski in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 646. - *Elymus excelsus* Turcz. in Bull. Soc. Nat. Mosc. XXIX, 1 (1856) 62; Griseb. in Ldb. Fl. Ross. IV, 331.

Perennial. A robust plant; culms stout, erect, to 150 cm tall; lower sheaths usually hairy, the hairs retrorse; leaves hairy on both surfaces, rarely glabrescent, green or glaucous-green, 1-1.8 cm broad; spikes 15-25 cm long, 1-1.5 cm broad, rachis ciliate on the angles; spikelets appressed, green, 4-6-flowered; glumes 0.8-1.1 cm long, (3)-5-7-nerved, gradually pointed, with awns 0.2-0.5 cm long; lemmas nearly smooth on the back, scaberulous on the sides and above, 0.9-1 cm long, prolonged into a spreading, scabrous awn, 1.5-2.8 cm long. July. (Plate XLIX, Figure 4, a-c).

Riverside meadows and bushy thickets. - East. Siberia: Daur.; Far East: Ze.-Bur., Ud., Ussur., Sakh. Gen. Distr.: Jap.-Chin. Described from surroundings of Kharattsai (Transbaikalia). Type in Khar'kov.

Genus 205. ASPERELLA* HUMB.

Humb. in Roemer ex Uneri, Magaz. Bot. III 7 (1790) 5.

Spikes linear; spikelets subarcuately divergent, in pairs, or partly solitary. Spikelets (1)-2-5-(6)-flowered, subsessile; rachilla jointed below the lowest floret. Glumes lacking or weakly developed, subulate, scabrous. Lemmas lanceolate, 5-7-nerved, glabrous or hairy and scabrous, awned. Lodicules pointed, hairy at the top. Anthers long. Caryopsis narrow, linear, hairy on the top, slightly furrowed. Perennials with creeping or short rhizomes and flat, scabrous, and usually hairy leaves.

1. Lemmas hairy, prolonged into awn 1-1.5 cm long 3. *A. Komarovii* Roshev.
+ Lemmas glabrous or scaberulous, the awn 2-5 mm long 2.
693 2. Spikelets greenish-purple, 2-3-flowered; glumes 1-5 (7) mm long or obsolete 2. *A. sibirica* Trautv.
+ Spikelets green, 2-5-(6)-flowered; glumes 0.7-1 cm long 1. *A. coreana* (Honda) Nevski.

1. *A. coreana* (Honda) Nevski comb. nova. - *Elymus coreanus* Honda in Journ. Fac. Sc. Imp. Univ. Tokyo, Sect. III, vol. 1 (1930) 17. - *E. dasystachys* var. *Maximoviczii* Kom. in A.H.P. XX (1901) 320.

Perennial. Rhizome short-creeping; culms 60-110 cm tall, hollow, rather stout, puberulent below the spike; sheaths of lower leaves villous, the long white hairs spreading or retrorse; leaves green, flat, 0.6-1.1 cm broad, scabrous and hairy on the upper surface, scabrous underneath. Spikes erect or sometimes nodding, 8-13 cm long, with a densely pubescent rachis; spikelets borne on very short pedicels, divergent at an angle, 1.2-1.8 cm long, 2-5-(6)-flowered, arranged in twos; rachilla jointed below the lowest floret; glumes slightly unequal, subulate, very narrow, scabrous, 1-3-nerved, 0.7-1 cm long; lemmas broadly lanceolate, 0.9-1.1 cm long, gradually tapering into a scabrous awn 2-3 mm long, scaberulous, 5-7 nerved; palea linear-lanceolate, to 1 cm long, acuminate,

* From Latin asper-rough.

bidentate at the summit, ciliate on the keels; anthers 7 mm long; lodicules pointed, hairy at the summit. June-July. (Plate XLIV, Figure 7).

Sands and sandy-gravelly deposits in river valleys. -Far East: Ussur. Gen. Distr.: Jap.-Chin. Described from the Seleg-Su Korania valley in Korea. Type in Tokyo.

2. *A. sibirica* Trautv. in A.H.P.V (1877) 132.

Perennial. Rhizome creeping, branching; culms densely soft-pubescent below the spike, more rarely glabrous, (25) 40-75 cm tall; leaves green, flat, 0.25-0.7 cm broad, scabrous and sometimes sparsely covered with scattered hairs on the upper surface, smooth or scaberulous on the lower surface. Spikes linear, (4) 5.5-13 cm long, with a pubescent rachis; spikelets arranged in pairs or solitary, greenish-purple, (1)-2-3-(5)-flowered, the uppermost floret usually reduced. Glumes represented by bristles 1-5 (7) mm long or lacking, unequal, scaberulous; lemmas lanceolate, slightly hairy (especially in lower part), or glabrescent, 5-nerved, 0.7-0.9 cm long, prolonged into a short, scabrous awn 3-5 mm long; palea linear-lanceolate, as long as the lemma or very slightly longer, pointed or bidentate, ciliate on the keels; anthers 5 mm long; lodicules pointed, hairy at the top. June. (Plate XLIX, Figure 5).

Meadows in river valleys. -East, Siberia: Len.-Kol., Daur. Endemic. Described from the valley of river Olenek. Type in Leningrad.

- 694 3. *A. Komarovii* Roshev. in Not. Syst. Herb. Horti Petrop. V (1924) 152. -*Hystrix sachalinensis* Ohwi in Bot. Mag. Tokyo XLV (1931) 378. -lc.: Kom. and Al. Oprod. (Determinations), tab. 68.

Perennial. Culms 80-150 cm tall, scabrous at the nodes, pubescent below the spike; sheaths hairy; leaves broadly linear, 1-2.8 cm broad, very scabrous, with scattered long hairs on the upper surface, green, thin, with numerous veins, the mid-rib prominent on the lower side. Spikes nodding or drooping, 10-15 cm long, green, with a densely hairy rachis; spikelets in twos or in the lower part of the spike solitary, 2-(3)-flowered; glumes reduced, subulate, 2-9 mm long, scabrous, distinctly 1-2-(3)-nerved, unequal; lemmas lanceolate, 0.8-1.2 cm long, 5-7-nerved, hairy, with shorter hairs at the base, prolonged into a straight or slightly flexuous awn 1-1.5 cm long; palea linear-lanceolate, bidentate at the summit, ciliate on the keels; caryopsis narrowly linear, hairy on the top, slightly concave on the inner side. June-July. (Plate XLIX, Figure 6).

Bottom-land forests. -Far East: Ussur., Ze.-Bur. Gen. Distr.: Jap.-Chin. Described from Khingan Valley on the Amur. Type in Leningrad.

NOTE. This plant was secondarily described in 1931 under the name *Hystrix sachalinensis* by Ohwi, who disposed of specimens from southern Sakhalin. Ohwi himself subsequently realized his mistake and soon produced a new combination: *Hystrix Komarovii* Ohwi (in Acta Phytotaxonomica et Geobotanica II, 1 (1933) 31).

In our opinion, however, there is no justification for changing the generic name *Asperella* to another (*Hystrix*), as it is done by American and Japanese authors.

Genus 206. ELYMUS* L.

L. (Hort. Ups. (1745) 22; Nova Plant. Gen. (1751) 34) Gen. pl. ed. 5 (1754) 45.

Spikelets 3-5-(6)-flowered, awnless, arranged on the rachis of the spike in twos, rarely in 4's-6's. Glumes lanceolate or narrowly lanceolate, 3-5-nerved, covering the backs of lemmas of the lower florets (not lateral), thinly membranaceous on the margin, glabrous or soft-hairy on the back, smooth. Lodicules pointed, hairy at the top. Anthers long, exceeding half the length of pales. Caryopsis linear-oblong, furrowed. Perennial plants with creeping rhizomes; leaves glaucous, stiff, subinvolute, smooth on the lower surface; plants growing on maritime and fluvial sands.

695 ECONOMIC IMPORTANCE. Species of the genus *Elymus* are associated with coastal and riverside sands and dunes, and may be employed for consolidation of sands. Particularly suitable for this purpose is *E. giganteus* Vahl. *Elymus* species are not generally acceptable as fodder, except in young state, when they are readily eaten by cattle. The grains of *Elymus arenarius* L. may be used for food, and they are sometimes gathered in the north of the U.S.S.R. for this purpose in unfavorable years. Leaves of wild-rye are used in weaving of mats. According to Glen, Gilyaks make ropes from the leaves of *E. mollis* Trin. and strings from the thin root fibers of this plant.

1. Spikelets arranged in 2's on the rachis of the spike 2.
- + Spikelets arranged in (3's) 4's-6's on the rachis of the spike 4. *E. giganteus* Vahl.
2. Plants 25-60 cm tall, with rather intensely purple-tinged, spikes 5-10 cm long. Glumes shorter than the spikelet, 0.9-1.4 cm long. Lemmas long-villous 3. *E. villosissimus* Scribn.
- + Plants 50-130 cm tall, with light glaucous-green of slightly purple-tinged spikes, 13-26 cm long. Glumes as long as or slightly shorter than the spikelet, (1.2) 1.4-3.4 cm long. Lemmas soft-hairy. 3.
3. Culms below the spike, or at least the rachis, densely short-pubescent. 2. *E. mollis* Trin.
- + Culms glabrous below the spike 1. *E. arenarius* L.

1. *E. arenarius* L. Sp. pl. (1753) 83; Griseb. in Ldb. Fl. Ross. IV, 331. -*Leymus arenarius* Hochst. in Flora VII (1848) 118, in adnot. -Lc.: Fl. Dan. Tab. 847. -Exs.: HFR No 496.

Perennial. A glaucous plant; culms stout, (40) 60-120 cm tall, smooth; leaves flat or with inrolled margins, stiff, quite glabrous underneath, very short-pubescent and scaberulous on the upper surface, 0.5-1 cm broad. Spikes erect, dense, 15-25 cm long, (1) 1.5-2.5 (3) cm broad; Spikelets (1.5) 2-3 cm long, (2)-3-5-flowered, with hairy rachilla; glumes lanceolate, long-acuminate, (1.5) 1.8-2.7 (2.9) cm long, (2.5) 3-4 mm broad, glabrous or hairy above, 3-5-nerved, the mid-nerve thicker than the other nerves; lemmas 1.4-2.1 cm long, broadly lanceolate, scaphoid, densely covered all over with soft hairs. June-July. (Plate XLIX, Figure 8, a, b).

* From Greek *Elymos*-a name for a species of millet employed by Hippocrates; according to Dioscorides identical with Latin *Panicum*.

Coastal sands.-Arctic: Arctic Eur., N. Zem.; European part: Kar.-Lap., Lad.-Il'm., Dv.-Pech. Gen. Distr.: Scand., Atl. Eur. Described from central Europe. Type in London.

2. *E. mollis* Trin. in Spreng. Neue Entdeck. II. (1821) 72; Griseb. in Ldb. Fl. Ross. IV, 332. -*E. cladostachys* Turcz. Fl. baic.-dah. II, I (1856) 351, forma *spicis ramosis*.

- 696 Perennial. A glaucous plant, 50-130 cm tall; leaves flat, 0.5-1.5 cm broad, or with inrolled margins, stiff, smooth underneath, scabrous on the upper surface. Spikes dense, 13-26 cm long, 3-5-flowered; glumes broadly lanceolate or lanceolate, long-acuminate, (1.2) 1.4-3.4 (2.5) 3-4 mm broad, covered with long, soft, implexed hairs, 3-5-nerved, thin, membranaceous; lemmas (1) 1.2-2.5 cm long, broadly lanceolate, 5-7-nerved, pointed, awnless, covered over the whole surface with soft hairs; lodicules to 5 mm long. June-July. (Plate XLIX, Figure 9, a-c).

Coastal sands.-Arctic: Anad.; Far East: Kamch., Okhot., Sakh., Ud., Ussur. Gen. Distr.: Jap.-Chin., N. Am., Bering. Described from Kamchatka. Type in Leningrad.

3. *E. villosissimus* Scribn. in U.S. Dept. Agricult. Div. Agrost. Bull. No 17 (1899) 326, fig. 622.

Perennial. Culms 25-60 cm tall, rather stout, densely soft-hairy in upper part below the spike; leaves glaucous, 0.3-0.8 cm broad, flat or with inrolled margins, smooth underneath, scaberulous on the upper surface. Spikes with pubescent rachis, dense, 5-10 cm long, 1.2-1.7 cm broad; spikelets 1.2-2 cm long, 3-5-flowered, densely villous; glumes lanceolate, pointed, 0.9-1.4 cm long, to 2.5 mm broad, hairy, thin, 3-(4)-nerved; lemmas broadly lanceolate, 1-1.3 (1.5) cm long, 5-7-nerved, villous. July-August. (Plate XLIX, Figure 10 a-e).

Lacustrine and volcanic (Kamchatka) sands, mainly in the alpine zone. -Arctic: Anad., Chukot., Arctic, Sib.; East. Siberia: Len.-Kol; Far East: Kamch. Gen. Distr.: Bering., Arct. America. Described from America.

4. *E. giganteus* Vahl, Symbolae Botan. III (1794) 10; Griseb. in Ldb. Fl. Ross. IV, 332. -*E. sabulosus* M. B. Fl. taur.-cauc. I (1809) 81. -*E. arenarius* β *sabulosus* et γ *giganteus* Shmal'g. Fl. II (1897) 667. -*E. turgaicus* Roshev., Tr. poczv. exped. (Proc. of Soil Expedition) II 7 (1910) 259. -Lc.: Jacqu. Ecl. Gram. (1813) tab. 37. -Exs.: HFR No 847; Herb. Fl. Cauc. No 117.

Perennial. Rhizome long, creeping; culms very stout, to 1-1.2 in diameter, 50-100 cm tall, scaberulous-pubescent below the spike; leaves glaucous-green, scabrous on the upper surface and on the margins, smooth underneath, 0.5-1.5 cm broad. Spikes erect, very dense, broader in lower part, (1.5) 2-3 (4) cm across, with a stout, glabrescent rachis; spikelets arranged in 4's-6's, in the terminal, more slender part of the spike in 3's or 2's, 4-5-(6)-flowered, pale glaucous-green, 1.5-2.2 cm long; glumes linear-lanceolate, long-acuminate, 1.5-2.8 cm long, longer than the spikelet or as long, with a prominent mid-nerve and 2 faint lateral nerves, smooth, glabrous; lemmas 1-1.4 cm long, lanceolate, awnless, pointed, 7-nerved, soft-hairy in lower part, glabrous near the summit. May-July. (Plate XLIX, Figure 11, a-c).

- 697 ECONOMIC IMPORTANCE. Before heading, the leaves and, to some extent, also the culms, are readily eaten by livestock, especially by horses which show preference for the lower part of the culms covered up by sand.

If cut not later than the beginning of heading, this species produces hay of satisfactory quality. Yields of hay 10-20 centners per hectare, seeds 4-8 centners. The plant is of outstanding importance for consolidation of sands, and as a grain and forage crop on northern semi-desert and desert sands, where other cultivated plants die out owing to drought.

Coastal and riverside sands, sandhills, and sandy steppes. -European part: Low. Don., Low. Volg., Crimea, Prichern.; Caucasus: Ciscauc., Dag., West. and East. Transcauc.; West. Siberia: Upp. Tob., Irt.; East. Siberia: Ang.-Sayan.; Daur.; Centr. Asia: Aral.-Casp., Pribalkh., Tyan'-Shan. Gen. Distr.: described from specimens of unknown origin.

E. giganteus Vahl. $\times$ *Aneurolepidium dasystachys* (Trin.) Nevski. -*Elymus jennisseeensis* Turcz. Fl. baic.-dah. II, 1 (1856) 351. -Culms to 6 mm in diameter. Spikes 1-2.4 broad below, with a softly pubescent rachis. Spikelets arranged in 3's, 5-6-flowered, longer than the glumes. A plant more similar in size and appearance to *E. giganteus*, but resembling *Aneurolepidium dasystachys* (Trin.) Nevski as regards features of glumes and floral bracts. -East. Siberia: Ang.-Sayan. (Krasnoyarsk).

Genus 207. ANEUROLEPIDIUM* NEVSKI

Nevski in *Acta Inst. Bot. acad. Sc. URSS*, ser. 1, I (1933) 27 nomen nud. *Descr., op. cit.*, II (1934).

Spikelets 2-12-flowered, with short awns, arranged on the rachis in groups of 2-3 (4), or sometimes solitary. Glumes subulate-linear or linear, with 1 often faint nerve, lateral (not covering the backs of lemmas of the lower florets), very scabrous on the margins above and on the back. Lodicules hairy at the top, pointed. Caryopsis furrowed. Perennial plants.

1. Spikelets in 2's-4's 2.
- + Spikelets solitary 19.
2. Glumes lanceolate and asymmetrical in lower part, nearly covering the base of the spikelet, gradually narrowed into a long aristate point 1. *A. angustum* (Trin.) Nevski.
- + Glumes linear or narrowly lanceolate in lower part, not covering the base of the spikelet 3.
3. Glumes longer than the spikelet or as long. Spikelets appressed to the rachis; rachis very rough with abundant stiff bristles 4.
- + Glumes shorter than the spikelet, rarely as long. Spikelets divergent from the rachis; rachis glabrous or hairy, rarely scabrous 6.
4. Spikelets in 2's (rarely in 3's in the middle part of the spike), 1.2-1.7 cm long 4. *A. kopetdaghense* (Roshev.) Nevski.
- + Spikelets in 3's (rarely in 2's), (1.4) 1.8-2.5 cm long 5.
5. Glumes 1.4-2 cm long 2. *A. tianschanicum* (Drob.) Nevski.
- + Glumes 2-3 cm long 3. *A. baldshuanicum* (Roshev.) Nevski.
6. Spikes oblong-ovoid, 5-7.6 cm long, (1) 1.2-2.5 cm broad. Spikelets in 2's-4's. Lemmas covered in upper part with short, appressed bristles 11. *A. ovatum* (Trin.) Nevski.

* The editors consider the separation of the group *Aneurolepidium* Nevski from the genus *Elymus* L. as not sufficiently well grounded.

- + Spikes linear or short-linear. Spikelets in 2's-3's. Lemmas quite glabrous or rather hairy 7.
- 7. Lemmas quite glabrous or scabrous toward the summit 17.
- + Lemmas pilose or villous 17.
- 8. Plants with short-creeping rhizomes, forming very dense tufts . . . 9.
- + Plants with long-creeping rhizomes, not forming dense tufts . . . 13.
- 9. Spikelets greenish-glaucous, sometimes faintly tinged with purple and covered with effaceable bloom; rachilla hairy. Plants of solonchak meadows 13. *A. akmolinense* (Drob.) Nevski.
- + Spikelets green or glaucous-green, sometimes faintly tinged with purple, without effaceable bloom; rachilla glabrous or scabrous. Plants of stony slopes 10.
- 10. Lemmas glabrous and smooth over the whole surface 11.
- + Lemmas roughened in upper part with minute appressed bristles . 12.
- 11. Glumes 0.8-1.1 (1.2) cm long. Lemmas lanceolate, 0.8-0.9 cm long 7. *A. karataviense* (Roshev.) Nevski.
- + Glumes 0.6-0.7 (0.8) cm long. Lemmas narrowly lanceolate, 0.6-0.7 cm long 8. *A. petraeum* Nevski.
- 12. Spikes linear, 9-14 cm long. Lemmas short-awned (awn 0.25-0.3 cm long), 0.9-1.1 cm long, covered over the whole surface or only in upper part with minute, indistinct, appressed bristles 5. *A. alaicum* (Korsh.) Nevski.
- + Spikes broadly linear, 5-8 cm long. Lemmas acuminate, very scabrous toward the summit, 1-1.3 cm long 6. *A. ugamicum* (Drob.) Nevski.
- 699 13. Spikelets in 2's-3's. Lemmas 0.4-0.6 cm long, with awn 2-3 mm long 14. *A. multicaule* (Kar. et Kir.) Nevski.
- + Spikelets in 2's, or solitary in the terminal and the basal part of the spike. Lemmas 0.7-0.9 cm long, tapering into an aristate point to 2 mm long 14.
- 14. Spikelets in 2's; spikes with a slender rachis; the lower pairs of spikelets divaricate. Plants 70-120 cm tall 15. *A. fasciculatum* (Roshev.) Nevski.
- + Spikelets arranged in 2's only in the middle part of the spike, in the basal and the terminal part solitary (weak spikes sometimes composed throughout of solitary spikelets). Plants 15-50 (80) cm tall . . . 15.
- 15. Culms strongly branching at the base, 15-40 cm tall. Spikes to 10 cm long 16.
- + Culms few, 40-80 cm tall. Spikes to 20 cm long 18. *A. pseudoagropyrum* (Trin.) Nevski.
- 16. Spikelets 1-1.5 cm long, arranged in 2's in the middle part of the spike, both spikelets of each pair sessile 17. *A. Regelii* (Roshev.) Nevski.
- + Spikelets (1) 1.5-2 (2.5) cm long, arranged in 2's in the middle part of the spike, one of the spikelets borne on a pedicel attaining 5 mm in length 16. *A. divaricatum* (Drob.) Nevski.
- 17. Rhizome long-creeping. Spikelets 1.2-1.8 cm long, (4)-5-7-flowered; glumes glabrous, scabrous above on the margins and on the keel 10. *A. dasystachys* (Trin.) Nevski.
- + Rhizome short-creeping; culms crowded in dense tufts. Spikelets 0.8-1.4 cm long, 2-3-(5)-flowered. Glumes often hairy 18.

18. Spikes short-linear; 4-7 cm long. Glumes only slightly shorter than the spikelet, 1-1.3 cm long 9. *A. flexile* Nevski.
 + Spikes linear, 7-12 cm long. Glumes shorter than the spikelet, 0.6-0.9 cm long 12. *A. Paboanum* (Claus) Nevski.
 19. Glumes very unequal, the upper awned, 0.6-1.2 cm long, the lower 0.3-0.55 cm long, pointed. Lemmas (0.9) 1-1.2 cm long, with awn 2-4 (5) mm long 20. *A. aemulans* Nevski.
 + Glumes 0.5-0.8 cm long, the lower but slightly, rarely markedly, shorter than the upper. Lemmas 0.6-0.8 cm long, with an awn-point to 2 mm long 19. *A. ramosum* (Trin.) Nevski.

Section 1. *Aphanoneuron* Nevski. - Glumes obscurely 1-nerved, very scabrous above on the back and margins, longer than or as long as the spikelet. Spikelets in 2's-3's appressed to the rachis.

- 700 1. *A. angustum* (Trin.) Nevski comb. nova. - *Elymus angustus* Trin. in Ldb. Fl. Alt. I (1829) 119; Griseb. in Ldb. Fl. Ross. IV, 334; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 368. - *E. turganicus* Roshev. in Flora Yugo-Vostoka Evrop. ch. SSSR (Flora of the Southeast of the European Part of the U.S.S.R.) II (1928) 253. - *E. kirghisorum* Drob. Trav. Mus. Bot. Ac. Sc. Petrogr. XIV (1915) 135, tab. II.: Ldb. Ic. Fl. Ross., tab. 229.

Perennial. Rhizome short-creeping, ascending; culms 60-100 cm tall, crowded in tufts, smooth, scabrous only below the spike; leaves to 0.7 cm broad, glaucous-green, very scabrous on the upper surface and on the margins, scaberulous underneath, with rather inrolled margins. Spikes linear, erect, narrow, 10-20 (25) cm long, 0.4-1 cm broad, dense or fairly dense, the lower rachis joints 1-1.7 (2) cm long; rachis covered with short, appressed, stiff hairs; spikelets pale glaucous-greenish, 1.2-1.5 (1.7) cm long, 2-3-flowered, arranged in 2's (rarely in 3's in the middle part of the spike); glumes 1.1-1.5 (1.8) cm long, lanceolately broadened and asymmetrical at the base, nearly covering the base of the spikelet, gradually tapering into an awn-point, scabrous on the back and serrulate in the upper part, obscurely 1-nerved; lemmas 1.1-1.4 cm long, lanceolate, covered with short, appressed, sometimes minute and rather indistinct hairs, 5-7-nerved, tapering into an awn-point 1.5-2.5 mm long. June-July. (Plate XLIX, Figure 12 a-d).

Solonetz and steppe meadows. - European part: Zavolzh.; West. Siberia: Upp. Tob., Irt., Atl.; Centr. Asia: Aral.-Casp., Pribalkh., Dzung.-Tarb., Tyan'-Shan., Pam.-Al. (Fergana). Gen. Distr.: Dzung.-Kashg. Described from Altai, from the valley of river Chuya. Type in Leningrad.

ECONOMIC IMPORTANCE. Hay of medium and more-than-medium quality. Yields 20-30 centners per hectare, or even higher.

2. *A. tianschanicum* (Drob.) Nevski comb. nova. - *Elymus tianschanicus* Drob. in Fedde, Repert. sp. nov. XXI (1925) 45.

Perennial. Rhizome creeping, branching; culms to 110 cm tall, scabrous below the spike; leaves glaucous, stiff, subinvolute, scabrous on the upper surface. Spikes erect, 19-22 cm long, somewhat interrupted below, dense above; rachis very densely clothed with short stiff bristles, very scabrous; lower rachis joints to 2.7 cm long; spikelets pale glaucous green, in 3's-(2's), 3-6-flowered, 1.4-2 cm long; glumes linear-subulate,



nerveless or obscurely keeled, very scabrous on the margins and on the back, 1.4-2.1 cm long; lemmas lanceolate, 1.1-1.3 cm long, scaberulous at the base, tapering into an awn-point 1-1.5 mm long, obscurely 5-nerved, June.

Submontane slopes. -Centr. Asia: Syr-Dar. Endemic. Described from the vicinity of Brich-Mulla station. Type in Tashkent.

3. *A. baldshuanicum* (Roshev.) Nevski comb. nova. -*Elymus Baldshuanicus* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS, XXX (1932) 779.

Perennial. Rhizome creeping; culms to 120 cm tall, very scabrous below the spike; leaves involute, glaucous-green, stiff, scabrous on the upper surface and on the margins. Spikes erect, 15-21 cm long, dense above, fairly dense below, the lower rachis joints 2-2.4 cm long; rachis very densely clothed with short stiff bristles, scabrous, especially in upper part of each joint; spikelets in 3's-(2's), 1.8-2.5 cm long, pale glaucous-green, 5-6-flowered; rachilla appressed-hairy; glumes linear-subulate, 2-3 cm long, with a faint nerve in upper part, very scabrous on the margins and on the back; lemmas lanceolate, scabrous at the base, 1.1-1.35 cm long, 5-nerved, tapering into an aristate point 1.5-2 mm long. June-July. (Plate XLIX, Figure 13, a-d).

Stony slopes. -Centr. Asia: Pam. -Al. Endemic. Described from Sengulak Mountains. Type in Leningrad.

4. *A. kopetdaghense* (Roshev.) Nevski comb. nova. -*Elymus kopetdaghensis* Roshev. in Acta Inst. Bot. Ac. Sc. URSS, ser. 1, II (1934) et in Acta Horti Bot. Ac. Sc. URSS, XLIV (1931) 56, nomen.

Perennial. Rhizome short-creeping; culms numerous, forming dense tufts, scaberulous below the spike, 60-90 cm tall; leaves glaucous-green, narrow, to 2.5 mm broad, involute, stiff, very scabrous on the upper surface, and often on the lower surface as well. Spikes slender, rather dense, pale glaucous-green, 10-22 cm long, 0.4-0.7 cm broad, the lower pairs of spikelets subremote, rachis covered with numerous bristles and scabrous in the upper part of each joint; lower rachis joints 1.2-2 cm long; spikelets in 2's (rarely in 3's in the middle part of the spike), 1.2-1.7 cm long, 3-5-flowered; glumes 1.5-2 cm long, subulate-linear, very narrow, with a faint nerve, very scabrous on the margins and on the back; lemmas lanceolate, 1-1.3 cm long, 5-nerved, tapering into a scabrous awn-point 1-2 mm long. May-June. (Plate XLIX, Figure 14, a-e).

Explanation to Plate XLIX

1. *Climelymus sibiricus* (L.) Nevski: a) spike; b) and c) lower and upper glume; d) lemma; e) palea.
- 2. *C. nutans* (Griseb.) Nevski: a) spike; b) and c) glumes; d) lemma. -3. *C. dahuricus* (Turcz.) Nevski: a) spike; b) and c) lower and upper glume; e) spikelet. -4. *C. exaltatus* (Turcz.) Nevski: a) and b) lower and upper glume; c) lemma. -5. *Asperella sibirica* Trautv.: spikelet. -6. *A. Komarovii* Roshev.: a) portion of spike with a pair of glumes of a spikelet; b) lemma; c) spikelet. -7. *A. coreana* (Honda) Nevski: a) portion of spike with a pair of spikelets; b) and c) lower and upper glume; d) lemma; e) anthers. -8. *Elymus arenarius* L.: a) spike joint with a pair of spikelets; b) lemma. -9. *E. mollis* Trin.: a) top of a spike; b) a detached spikelet; c) glumes. -10. *E. villosissimus* Scribn.: a) spike; b) spikelet; c) glumes; d) lemma. -11. *E. giganteus* Vahl: a) portion of a spike; b) spikelet; c) lemma. -12. *Aneurolepidium angustum* (Trin.) Nevski: a) spike; b) glumes; c) lemma; d) spikelet. -13. *A. baldshuanicum* (Roshev.) Nevski: a) rachis joint with 3 pairs of glumes; b) glumes; c) lemma; d) palea. -14. *A. kopetdaghense* (Roshev.) Nevski: a) spike; b) spikelet; c) glumes; d) lemma; e) palea.

Gravelly mountain slopes. -Centr. Asia: Upp. Turkm. Endemic. Described from Gr. Balkhany. Type in Leningrad.

Section 2. *Brachycalyx* Nevski. -Glumes obscurely 1-nerved (very rarely 3-nerved), scabrous above on the back and on the margins, shorter than the spikelet. Spikelets arranged in groups of 2-4, more rarely spikelets in the upper part or near the base solitary, subdivergent.

Series 1. *Petraeae* Nevski. -Plants with short-creeping rhizome, forming dense tufts. Lemmas glabrous or scabrous toward the summit. Plants of stony slopes.

5. *A. alaicum* (Korsh.) Nevski comb. nov. -*Elymus alaicus* Korsh. Mem. Acad. Petersb., ser. IV, 4 ((1896) 102.

Perennial. Culms 60-100 cm tall, numerous, glabrous, scabrous only in upper part below the spike, profusely covered at the base with brownish-yellow, smooth remnants of old sheaths, forming dense tufts 10-20 cm in diameter; leaves glaucous-green, flat, 0.3-0.6 cm broad, or with inrolled margins, stiff, very scabrous on the upper surface and on the margins, scaberulous underneath. Spikes linear, dense, 9-14 cm long, rachis scabrous, hispid on the angles; spikelets in 2's or in 3's in the middle part of the spike, glaucous-green, faintly tinged with purple, 4-5-flowered, 1.3-1.9 cm long; glumes 0.9-1.5 (1.8) cm long, subulate-linear, finely tapering into a short, scabrous awn (length of glumes indicated includes awn), 1-nerved, scabrous on the margins and on the back in upper part; lemmas lanceolate, 0.9-1.1 cm long, tapering into awn 0.25-0.3 cm long, 7-nerved, scaberulous, covered in upper part or over the whole surface with minute, indistinct, appressed bristles. June.

Stony slopes. -Centr. Asia: Pam. -Al. Endemic. Described from Alai Valley. Type in Leningrad.

6. *A. ugamicum* (Drob.) Nevski comb. nova. -*Elymus ugamicus* Drob. in Fedde. Repert. sp. nov. XXI (1925) 45.

Perennial. Culms 50-70 cm tall, glabrous, pubescent below the spike, covered at the base with remnants of old sheaths, crowded in dense tufts; leaves glaucous-green, subinvolute, stiff, scabrous on the inside and on the margins. Spikes dense, broadly linear, 5-8 cm long, 1 cm broad, with scabrous rachis; spikelets in 2's or 3's, green or slightly tinged with purple, 1.3-1.7 cm long, 3-5-flowered, slightly divergent; glumes 1.2-1.5 cm long, subulate-linear; lemmas lanceolate, 5-nerved, acuminate, scabrous toward the summit, 1-1.3 cm long.

Stony slopes. -Centr. Asia: Syr-Dar. Endemic. Described from mountains near Tashkent. Type in Tashkent.

705 7. *A. karataviense* (Roshev.) Nevski comb. nova. -*Elymus karataviensis* Roshev. Tr. pochv. -Bot. exped. (Proc. of Soil and Bot. Exped.), ser. II, 6 (1912) 186, tab. 27. -*E. junceus* var. *glabriusculus* Rgl. in A. H. P. VII (1880) 584.

Perennial. Culms smooth and glabrous, scaberulous only below the spike, 30-55 cm tall, covered at the base with grayish, smooth and shining remnants of old sheaths, crowded in dense tufts; leaves involute, to 2 mm broad, glaucous-green, scabrous on the inside and on the margins, smooth on the lower side. Spikes pale green, dense, 6-12 cm long, (0.4) 0.5-0.8 cm broad, with scabrous rachis; spikelets in 2's, 0.9-1.5 cm long, 2-5-flowered, glabrous; glumes 0.8-1.1 (1.2) cm long, subulate-linear, obscurely 1-nerved; lemmas broadly lanceolate, entirely glabrous and

smooth, 0.8-0.9 cm long, abruptly narrowed into an awn-point 0.5 mm long. June.

Stony slopes. - Centr. Asia: Tyan'-Shan (Karatau). - Endemic. Described from the area between Kok-bulak and Bish-saz. Type in Leningrad.

8 *A. petraeum* Nevski in Acta Inst. Bot. Acad. S. URSS, ser. I, II (1934).

Perennial. Culms 50-70 cm tall, smooth and glabrous, covered at base with yellow-brown remnants of old sheaths, crowded in dense tufts; leaves narrowly linear, to 2.5-3 mm broad, nearly flat or subinvolute, glaucous-green, very scabrous on the margins, smooth underneath. Spikes linear, dense, 6.5-8.5 cm long, 0.4-0.5 cm broad, pale green, with a scabrous awn; spikelets in 2's, 1-3 cm long, 4-5-flowered, glabrous; glumes 0.6-0.7 (0.8) cm long, very narrowly linear-subulate, with a faint nerve, finely pointed, scabrous on the margins and on the nerve; lemmas narrowly lanceolate, 0.6-0.7 cm long, gradually tapering into a very short awn-point (0.5-1 mm long), entirely glabrous and smooth. June

Stony slopes. - Centr. Asia: Özung. - Tarb. Endemic. Described from the surroundings of Zaisan. Type in Leningrad.

Series 2. *Flexiles* Nevski. - Plants with a short-creeping rhizome, forming dense tufts. Spikes short-linear, densely villous. Plants of stony slopes.

9. *A. flexile* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, II (1934).

706 Perennial. Culms 30-70 cm tall, glabrous and smooth all the way up, slightly curved and covered with grayish-brown remnants of old sheaths at the base; leaves glaucous-green, very narrow, involute, more rarely those of the culm nearly flat, to 3 mm broad, smooth underneath, scabrous on the upper surface. Spikes dense, short-linear, 4-7 cm long, 0.7-0.9 cm broad, with a flexible, puberulent rachis; spikelets in 2's, grayish-green, densely pubescent, 1.1-1.4 cm long, 2-3-flowered; glumes subulate-linear, terminating in an awn-point, scabrous above on the margins; lemmas lanceolate, 0.8-1 cm long, densely covered with soft white hairs, gradually tapering into awn 1-2 mm long; palea narrowly lanceolate, densely ciliate on the margins. July-August.

Stony high-mountain slopes. - Centr. Asia: Tyan'-Shan (Talas, Alatau). Endemic. Described from stony screes by the upper course of river Dzheboglysu. Type in Leningrad.

Series 3. *Dasyanthae* Nevski. - Rhizome long-creeping. Spikelets in 2's-4's, 1.2-2 cm long. Lemmas hairy. Plants of riverside sands and meadows.

10. *A. dasystachys* (Trin.) Nevski comb. nova. - *Elymus dasystachys* Trin. in Ldb. Fl. Alt. I (1829) 120, ex parte; Griseb. in Ldb. Fl. Ross. IV, 333. - *Agropyron berezovacanum* var. *villosum* Prodan Contribut. bot. de Cluj I, 17 (1930) 2. - Ic.: Ldb. Ic. Fl. Ross., tab. 249.

Perennial. Culms erect, usually few or corded in small tufts, puberulent below the spike or glabrous all the way up, covered at the base with grayish or brownish remnants of old sheaths more or less separating into individual fibers; culms 40-100 cm tall; leaves glaucous- or grayish-green, subinvolute or flat, 0.25-0.7 cm broad, very scabrous on the upper surface and margins, smooth or scabrous underneath, glabrous, stiff. Spikes

dense, erect, broadly linear, sometimes somewhat interrupted near the base, (6) 7-17 cm long, (0.7) 1-1.7 (2) cm broad, rachis short-pilose or glabrous, hispid on the angles; spikelets arranged in groups of 2 or 3 (rarely 4), grayish- or glaucous-green, with a distinct purple shade more rarely without it, 1.2-1.8 cm long, (4)-5-7-flowered; a tuft of long white hairs nearly always present at the base of the spikelet; glumes subulate-linear, somewhat narrower in the lower part, prolonged into an awn-point, including this (0.8) 0.9-1.4 cm long, 1-nerved, (more rarely with 2 faint lateral nerves), very scabrous on the mid-nerve and margins; lemmas lanceolate, 0.8-1.1 cm long, tapering into a scabrous awn 1-3 mm long, the lower part or nearly the whole surface, except the very summit, covered with subappressed soft hairs (very rarely nearly the entire lemma glabrous, with minute bristles only at the base and the sides). June-July.

Riverside sands, meadows. -West. Siberia: Alt.; East. Siberia: Len. - Kol. Daur., Ang. -Sayan.; Centr. Asia: Dzung.-Tarb., Tyan'-Shan., Pam. - Al. (eastern part). Gen. Distr.: Dzung.-Kashg., Mong. Described from Altai. Type in Leningrad.

707 11. *A. ovatum* (Trin.) Nevski comb. nova. -*Elymus ovatus* Trin. in Ldb. Fl. Alt. I (1829) 121. -*Id.*: Ldb. *Id.* Fl. Ross. tab. 251.

Perennial. Culms few, 40-90 cm tall, scabrous below the spike; leaves flat or with inrolled margins, glaucous-green, 0.3-0.6 cm broad, scabrous on the upper surface and margins, sometimes with scattered hairs on the upper surface, smooth or scaberulous underneath. Spikes oblong-ovoid or oblong, 5-7.5 cm long, (1) 1.2-2.5 cm broad, very dense, with a scabrous rachis; spikelets in 2's-4's, yellowish- or brownish-green, 1.6-2 cm long, 5-7-flowered; glumes 1.0-1.5 cm long, subulate-linear, gradually and imperceptibly prolonged into a short, scabrous awn, very narrow, 1-nerved, scabrous on the margins; lemmas broadly lanceolate, 1-1.1 cm long, covered in upper part with appressed bristles, ciliate on the margins, 7-nerved, tapering into a scabrous awn 0.3-0.4 cm long. July.

Riverside sands, meadows. -West. Siberia: Alt. Gen. Distr.: Mong. (Tannu-Tuva). Described from Altai, from the valley of river Chulyshman. Type in Leningrad.

Series 4. *Salsuginosae* Nevski. -Rhizome creeping, rather short. Spikelets in 2's-3's, 0.8-1.3 cm long. Lemmas villous or entirely glabrous. Plants of solonchak meadows and solonchaks.

12. *A. Paboanum* (Claus) Nevski comb. nova. -*Elymus Paboanus* Claus in Beitrage zur Pflanzenkunde des Russischen Reiches VIII (1851) 170; Shmal'g. Fl. II (1897) 668. -*E. dasystachys* var. *salsuginosus* Griseb. in Ldb. Fl. Ross. IV (1853) 333. -*E. salsuginosus* Turcz. mscr. ex Ldb. l.c. 333. -*E. glaucus* Rgl. in A.H.P. VII (1870) 585.

Perennial. A glaucous plant; culms rather crowded in small tufts, glabrous and smooth to scabrous and hairy below the spike, 45-90 cm tall; leaves flat, 0.3-0.6 cm broad, or with inrolled margins, stiff, thick-veined. Spikes erect, dense, 7-12 cm long, 0.5-1.1 (1.3) cm broad, slightly narrowed toward the top, with appressed-hairy rachis; lower rachis joints 0.6-0.9 cm long; spikelets whitish- to grayish-green, 0.8-1.3 cm long, 3-5-flowered, arranged on the rachis in 2's, more rarely in 3's, villous; glumes 0.6-0.9 cm long, subulate-linear, very narrow, pilose, rarely glabrescent, nerveless or obscurely 1-nerved; lemmas 0.6-0.85 cm long, broadly lanceolate, abruptly narrowed, acute or terminating in an awn-point

0.5-1 mm long, with a dense cinerous coating of long hairs, sometimes very faintly-purple-tinged at the base: June-July.

Solonchak meadows and solonetz. -European part: Low. Volg., Zavolzh.; West. Siberia: Irt., Upp. Tob.; East. Siberia: Ang.-Sayan.; Centr. Asia: Aral.-Casp., Pribalkh., Dzung. -Tarb., Tyan'-Shan., Pam.-Al. (Fergana). Gen. Distr.: Mong., Dzung.-Kashg. Described from the river Kinel'. Type in Leningrad.

- 708 13. *A. akmolinense* (Drob.) Nevski comb. nova. -*Elymus akmolinensis* Drob. in Trav. Bot. Mus. Ac. Sc. Pétersb. XIV (1915) 133, tab. I, fig. 1-3.

Perennial. A glaucous plant: culms smooth, scaberulous only below the spike 45-80 cm tall, lower part frequently articulated, leaves almost flat, to 0.5 cm broad, or involute, very scabrous on the upper surface and margins, stiff. Spikes erect, dense, 6-10 (12) cm long, 0.5-0.7 (0.8) cm broad; rachis pilose or hispid only on the angles, the lower rachis joints 0.5-1 cm long; spikelets pale glaucous-green, sometimes with a faint purple shade (lemmas tinged in their lower part), often with a glaucous bloom, in 2's (rarely in 3's), 2-4-(5)-flowered, 0.8-1.2 (1.4) cm long; rachilla covered with short appressed hairs glumes 0.7-1 cm long, subulate-linear, very narrow, with a faint nerve, scabrous in upper part on the margins and on the back, smooth on the back below; lemmas lanceolate, 0.6-0.85 cm long, tapering into awn 2 mm long, smooth and glabrous, more rarely scaberulous. June.

Solonchak meadows and solonchaks. -European part: Zavolzh.; West. Siberia: Upp. Tob., Irt.; East. Siberia: Ang.-Sayan.; Centr. Asia: Aral.-Casp. Endemic. Described from a solonchak near the village Brai (former Akmolinsk District). Type in Leningrad.

Series 5. *Multicaules* Nevski. -Rhizome long-creeping. Spikes often slightly nodding, with spikelets arranged in groups of 2-3. Lemmas glabrous, lustrous. Plants of saline meadows.

14. *A. multicaule* (Kar. et Kir.) Nevski comb. nova. -*Elymus multicaulis* Kar. et Kir. in Bull. Soc. Nat. Mosc. XIV (1841) 868; Griseb. in Ldb. Fl. Ross. IV 331. -*E. aralensis* Rgl. in Bull. Soc. Nat. Mosc. XLI 2 (1868) 285; A. H. P. VII (1880) 584.

Perennial. Culms 50-75 cm tall, glabrous and smooth, scaberulous only below the spike, with brownish-gray remnants of old sheaths at the base; leaves flat, 0.3-0.8 cm broad, sometimes with slightly inrolled margins, glaucous- or grayish-green, scabrous on the upper surface and sometimes underneath. Spikes 5-11 (12) cm long, 0.6-1.3 cm broad, erect or slightly nodding, linear, dense, somewhat interrupted in lower part, rachis scabrous on the angles; spikelets green, sometimes with a faint purple shade, 0.8-1.4 (1.5) cm long, (2)-3-6-flowered glumes subulate, finely pointed, 0.4-0.7 (0.8) cm long, 0.25-0.3 mm broad, 1-nerved, scabrous on the nerve and margins; lemmas broadly lanceolate, entirely glabrous, lustrous, obscurely nerved, 0.4-0.6 cm long, tapering into scabrous awn 2-3 mm long. May-July. (Plate L, Figure 1 a-d).

- 709 Solonets meadows, solonchaks. -European part: Low. Volg.: Centr. Asia: Dzung.-Tarb., Pribalkh., Tyan'-Shan., Syr-Dar., Aral.-Casp. Described from Tarbatagai. Type in Leningrad.

Series 6. *Ramosae* Nevski. -Rhizome long-creeping, branching. Spikelets arranged in the middle part of the spike in pairs, in basal and terminal parts usually solitary. Lemmas glabrous, lustrous.

15. *A. fasciculatum* (Roshev.) Nevski comb. nova. -*Elymus fasciculatus* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 780. Perennial. Culms glabrous, smooth or scaberulous below the spike, 70-120 cm tall; sheaths scabrous; leaves flat, 0.5-0.8 cm broad, glaucous-green, stiff, very scabrous on the upper surface and on the margin, scabrous to nearly smooth underneath. Spikes 10-19 cm long, rather dense, rachis very scabrous on the 2 main angles, the lower pairs of spikelets remote (lower rachis joints (1.2) 1.5-2.5 cm long); spikelets in 2's (rarely solitary in lower part of the spike or at the top), green or faintly tinged with purple, glabrous, shining, (1.4) 1.7-2.6 cm long, (5)-7-12-flowered, one of the spikelets occasionally short-pedicelated; rachilla glabrous; glumes 0.7-1.1 (1.2) cm long, usually shorter than the lowest floret, linear-subulate, obscurely keeled, serrulate and scabrous on the margin above; lemmas lanceolate, obscurely 5-nerved above, 0.7-0.9 cm long, with awn 1-2 mm long. June.

Riverside sands. -Centr. Asia: Aral.-Casp. -Endemic. Described from Sary-sy lowlands. Type in Leningrad.

16. *A. divaricatum* (Drob.) Nevski comb. nova. -*Elymus Divaricatus* Drob. in Fedde, Repert. sp. nov. XXI (1925) 45.

Perennial. Culms branching below, slender, smooth, 20-40 (50) cm tall, scabrous below the spike; leaves glaucous-green, flat, 0.3-0.7 cm broad, very scabrous on the upper surface and on the margins, spreading; sheaths glabrous; ligule very short; auricles linear-lanceolate. Spikes linear, 8-10 cm long, 1.5 cm broad, rachis hispid on the angles; spikelets glaucous-green, slightly divergent from the rachis, arranged in 2's in the middle part of the spike, one sessile, the other borne on a pedicel to 5 mm long, spikelets at the base and the top of the spike solitary; spikelets (1) 1.5-2 (2.5) cm long, 5-10-flowered; glumes 0.6-0.8 (1) cm long, linear-subulate, fine-pointed, with a faint nerve; lemmas broadly lanceolate, tapering into a short, scabrous point, lustrous, 5-7-nerved above, 0.7-0.8 cm long.

Fallows and arable fields. -Centr. Asia: Syr-Dar. Endemic. Described from the vicinity of Burnenskile experimental field. Type in Tashkent.

17. *A. Regelii* (Roshev.) Nevski comb. nova. -*Elymus Regelii* Roshev. in Bull. Jard. Bot. Ac. Sc. URSS XXX (1932) 781.

710 Perennial. Culms branching at the base, 16-30 cm tall, glabrous, scaberulous below the spike; leaves glaucous-green, flat, 0.3-0.7 cm broad, very scabrous on the upper surface and margins, scaberulous underneath; sheaths faintly scaberulous; ligule short; auricles linear-lanceolate. Spikes linear, fairly dense, 5-9 cm long, with a rather scabrous awn; spikelets in 2's in the middle part of the spike, sessile, glaucous-green, 5-7-flowered, 1-1.5 cm long; glumes 0.5-1 cm long, linear-subulate, fine-pointed, obscurely 1-nerved; lemmas broadly lanceolate, abruptly pointed, lustrous, 5-nerved above, 0.7-0.8 cm long, occasionally with an awn-point 1 mm long. June.

Riverside sands, sandy places. -Centr. Asia: Dzung.-Tarb. Gen. Distr.: Dzung.-Kashg. Described from Kul'dzha area. Type in Leningrad.

18. *A. pseudoagropyrum* (Trin.) Nevski comb. nova. -*Elymus pseudoagropyrum* Trin. ex Turcz. Bull. Soc. Nat. Mosc. (1838) 105, nomen; (1856) 63. -*Triticum pseudoagropyrum* Griseb. in Ldb. Fl. Ross. IV (1853) 343. -*Agropyrum pseudoagropyrum*

Franchet, Fl. David. (1884) p-340. -? *Agropyron berezovcanum*
Prodan Contrib. bot. de Cluj I, 17 (1930) 1.

Perennial. Culms 40-80 cm tall; sheaths smooth; leaves glaucous-green, scabrous on the upper surface and on the margins, and sometimes covered with scattered hairs, smooth underneath, flat, to 0.5-0.8 cm broad, or subinvolute. Spikes linear, 8-16 (19) cm long, often interrupted below, rachis hispid on the angles; spikelets solitary in terminal part and at the base of the spike, in 2's in the middle part (more rarely, in weak spikes, all spikelets solitary), 1-2 cm long, 5-8-flowered, glaucous-green, slightly divergent. Glumes linear-subulate, (0.5) 0.6-0.8 cm long, 1-nerved; lemmas lanceolate, 0.8-0.9 cm long, tapering into an awn-point 0.5-2 mm long. June-August.

Steppes, steppe meadows. -East, Siberia: Ze.-Bur., Daur., Ang.-Sayan.; Far East: Ussur. (introduced). Gen. Distr.: Mong. Described from the surrounding of Kharattsai (Transbaikalia). Type in Leningrad.

ECONOMIC IMPORTANCE. Wherever this species grows, it appears in large concentrations, and provides excellent, though somewhat coarse, forage. The most important forage grass of Transbaikalia and Mongolia.

19. *A. ramosum* (Trin.) Nevski comb. nova. -*Triticum ramosum* Trin. in Ldb. Fl. Alt. I (1829) 114; Griseb. in Ldb. Fl. Ross. IV 343. -*Agropyrum ramosum* Richt. Fl. Eur. I (1890) 126; Shmal'g. Fl. II 658; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II 355. -Ic.: Ldb. Ic. Fl. Ross. tab. 245.

711 Perennial. Rhizome creeping; culms branching at the base, 20-45 cm tall, smooth and glabrous; leaves glaucous-green, subsetaceous-involute or flat and then 2-6 mm broad, stiff, scabrous on the upper surface and on the margins, smooth on the lower surface; sheaths smooth; ligule very short, auricles linear-lanceolate, falcate. Spikes linear, (3) 4-8 cm long, rather loose, rachis hispid on the angles lower rachis joints 0.6-1 cm long; spikelets solitary, glaucous-green, more rarely somewhat purple-tinged, occasionally covered with fugaceous glaucous bloom, 1.1-1.5 (1.7) cm long, (4)-5-7-(9)-flowered; glumes 0.5-0.8 (0.9) cm long, the lower slightly or markedly shorter than the upper, both stiff and very narrow, linear-subulate, fine-pointed, nerveless or obscurely 1-nerved; lemmas broadly lanceolate or subelliptical-lanceolate, 0.6-0.8 cm long, awnless or sometimes with an awn-point to 2 mm long. June-July.

Solonchaks, solonchaks steppes; fallows. -European part: Prichern., Low. Don., Low. Volg.; Zavolzh.; Caucasus: Ciscauc.; West. Siberia: Alt., Irt., Upp. Tob.; East. Siberia: Ang.-Sayan.; Centr. Asia: Aral.-Casp., Pribalkh. Described from the valley of Irtysh, in the Semipalatinsk area. Type in Leningrad.

ECONOMIC IMPORTANCE. An excellent forage plant. As regards nutritive value and palatability, the hay of this plant ranks among the best and is more highly valued than hay made of quackgrass species. *Aneurolepidum ramosum* hardly ever produces seeds, but its vegetative reproduction is very vigorous. Hay yields 4-6 centners per hectare, in best years up to 10-12 centners. Most widespread in 3-7-year old fallows, on dark-chestnut and chestnut soils. To raise the yields of fallows, breaking up in fall or spring is recommended in wet weather. A troublesome weed of grain crops, calling for resolute control measures in all plots included in rotation.

Series 7. *Aemulantes* Nevski. -Spikelets solitary, with a very brittle rachilla. Glumes unequal. Lemmas glabrous, lustrous. Plants of stony slopes. Rhizome short-creeping, much branched.

20. *A. aemulans* Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, II (1934).

Perennial. Rhizome short-creeping; culms numerous, slender, glabrous and smooth, forming dense tufts; leaves narrowly linear, to 2.5 cm broad, flat or subinvolute, glaucous-green, scabrous on the upper surface, smooth underneath. Spikes erect, loose (spikes as long as rachis joints or slightly longer), 5-10 cm long; spikelets pale green, 3-5-flowered, 1.5-2 cm long; glumes subulate-linear, very narrow, somewhat lanceolately broadened at the base, to 0.5-0.75 mm broad, gradually tapering into short awn, very unequal, the upper 0.6-1.2 cm long with awn, the lower 0.3-0.55 cm long, pointed or terminating in a short aristate point, nerveless, glabrous; lemmas (0.9) 1-1.2 cm long, entirely smooth and glabrous, broadly lanceolate, obscurely 5-nerved, tapering into a scabrous awn 2-4 (5) mm long. May-June.

Stony slopes. -Centr. Asia: Tyan'-Shan. (Karatau). Endemic. Described from Ichkele-tau Mountains. Type in Leningrad.

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Genus 208. MALACURUS* NEVSKI

Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, II (1934).

Spikes erect, dense; with a glabrous, smooth, continuous rachis. Spikelet arranged in pairs, 3-4-flowered, rachilla very brittle, disarticulating between the florets. Glumes subulate-setiform, entirely glabrous and smooth, lustrous, lateral. Lemmas densely lanate, 7-9-nerved, short-awned. Awns 1.5-2 mm long, almost smooth, rather deciduous. Lodicules ovate-lanceolate, densely long-ciliate. Perennial, densely tufted plants, with a short-creeping rhizome and stiff, glaucous-green leaves.

1. *M. lanatus* (Korsh.) Nevski comb. nova. -*Elymus lanatus* Korsh. in Mém. Ac. Sc. Pétersb., ser. 8, IV, 4 (1896) 102.

Perennial. Culms 45-85 cm tall, erect, glabrous and smooth all the way up, usually pruinose; leaves flat, 0.4-0.7 cm broad, scabrous on the upper surface, smooth underneath. Spikes broadly linear, 6-13 cm long. (1.2) 1.5-2.2 cm broad, densely soft-villous (only lemmas covered with hairs to 2 mm long); spikelets 1.2-1.5 cm long, with a brittle, subcapillary rachilla; glumes shorter than the spikelet, 0.6-1 cm long; lemmas lanceolate, 0.9-1 cm long; palea as long as the lemma, long-ciliate on the margins. July-August. (Plate L, Figure 2, a-d).

Stony high-mountain slopes. -Centr. Asia: Pam.-Al. Described from Alai Valley. Type in Leningrad.

NOTE. A monotypic genus, very distinct on account of the consistency of its lemmas, which are herbaceous-membranaceous, soft, and thin. Among the *Elymus*-like genera, most closely approaching genera of *Bromeae* and *Aveneae* groups. Particularly distinctive because of the

* From Greek: *malakos*-soft, and *ura*-tail.

structure of its glumes and rachilla. Anthers long, exceeding half the length of the palea, purplish-brown.

Genus 209. PSATHYROSTACHYS* NEVSKI

Nevski in Act. Inst. Acad. Sc. URSS, ser. 1, II (1934)

Spikelets arranged in 2's or 3's, 2-3-flowered, or 1-flowered with a rudimentary second floret, all sessile. Spikes with a very brittle rachis, readily disarticulating between the spikelets. Glumes subulate-setiform, obscurely 1-nerved, covered with long hairs or scabrous. Perennial, densely tufted plants.

- 713 1. Lemmas with awn 3-5.7 cm long. Glumes long-awned, their length, including awn, to 6 cm 6. *P. fragilis* (Boiss.) Nevski.
 + Lemmas with awn 0.1-0.6 cm long. Glumes to 1-1.3 cm long 2.
 2. Spikelets 2-3-flowered 3.
 + All spikelets 1-flowered with a rudiment of second floret, or the middle spikelets 2-flowered, with a long-pediceled second floret, the lateral spikelets being 1-flowered, with a rudimentary second floret 4.
 3. Glumes densely clothed with long, slender, white, strongly spreading hairs, hence seemingly plumose. Spikes oblong-ovoid or oblong-elliptical, 1.5-4 cm long 3. *P. lanuginosa* (Trin.) Nevski.
 + Glumes scabrous or short-hairy. Spikes linear, (3) 5-11 cm long 2. *P. juncea* (Fisch.) Nevski.
 4. Leaves usually flat, 0.3-0.5 cm broad, scabrous on both surfaces 1. *P. Kronenburgii* (Hack.) Nevski.
 + Leaves very narrow and involute (especially the basal leaves), those of the culm sometimes flat, 0.1-0.3 cm broad, smooth underneath, scabrous on the upper surface and on the margins 5.
 5. Spikelets in 3's, the lateral ones 1-flowered, the middle one 2-flowered, with a long-pediceled second floret 4. *P. daghestanica* (Alex.) Nevski.
 + Spikelets in 2's 1-flowered 5. *P. rupestris* (Alex.) Nevski.

Section 1. *Hordella* Nevski. -Spikelets 1-flowered, with a rudimentary second floret. Glumes straight, slightly shorter than the spikelet. Leaves flat, rarely subinvolute.

1. *P. Kronenburgii* (Hack.) Nevski comb. nova. -*Hordeum kronenburgii* Hack. in Allg. Bot. Zeitschr. (1905) 133. -Exs.: Herb. Kronenburgianum No 56.

Perennial. Culms 50-100 cm tall, erect, soft-pubescent below the spike, enveloped at the base by grayish-brown remnants of old sheaths, more or less separating into individual fibers; leaves glaucous-green or green, flat. Spikes linear, erect, very brittle, 5-7.5 cm long, 0.8-1 cm broad, greenish or with a rather pronounced purple shade, grayish-villous, rachis joints 2.5-3.5 mm long, hirsute; spikelets in 3's, 0.8-1 cm long; glumes subulate, covered with long hairs, slightly shorter than the spikelet, 0.7-1 cm

* From Greek psathyros=brittle, and stachys=spike.

long; lemmas lanceolate, 5-nerved, covered with soft, long hairs, 0.8-1 cm long, tapering into a short awn-point or awn to 2-2.5 mm long. June-July.

- 714 Stony mountain slopes, among *Juniperus* thickets. -Centr. Asia: Pam.-Al., Tyan'-Shan., Dzung.-Tarb. Endemic. Described from the Taldyk Pass in southeastern Fergana. Type in Vienna.

Section 2. *Eupsathyrostachys* Nevski. -Spikelets 2-3-flowered. Glumes straight, shorter than the spikelet. Leaves nearly flat.

2. *P. juncea* (Fisch.) Nevski comb. nova. -*Elymus junceus* Fisch. Mém. Soc. Nat. Mosc. I (1806) 45; Griseb. in Ldb. Fl. Ross. IV 333; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 371. -*E. altaicus* Spreng. Tent. (1806) 5. -*E. desertorum* Kar. et Kir. in Bull. Soc. Nat. Mosc. XIV (1841) 867. -*E. hyalanthus* Rupr. in Osten-Sacken et Rupr. Sert. Tiansch. (1869) 36. -*E. Alberti* Rgl. in A. H. P. VII (1880-81) 561. -*E. kokczetaavicus* Drob. in Trav. Mus. Bot. Acad. Sc. Petrogr. XIV (1915) 131. -*E. caespitosus* Suk. Trav. Mus. Bot. Acad. Sc. Pétersb. XI (913) 80. -*E. cretaceus* Zing. in herb. -Ic.: Fisch., l.c., tab. 4.

Perennial. Culms (20) 30-70 (80) cm tall, slender, smooth, scabrous only below the spike, crowded in dense tufts and enveloped at the base by grayish-brown remnants of old sheaths, more or less separating into fibers; leaves glaucous- or grayish-green, scabrous on both sides, flat, with in-rolled margins, basal leaves exceeded several times in length by the culms. Spikes very brittle, (3) 5-11 cm long and 0.7-1.2 cm broad, rachis joints ciliate on the angles, 0.2-0.5 (0.6) cm long; spikelets greenish, yellowish-brown in maturity, in (2's) 3's, (0.7) 0.8-1 cm long, hairy or scabrous, obscurely 1-nerved; lemmas lanceolate, covered with short and stiff or long and soft, sometimes very dense, hairs, 5-7-nerved, 0.7-0.8 cm long, tapering into awn 1.5-2 mm long. June-July. (Plate L, Figure 6, a-e).

Dry slopes, steppes, steppe slopes. -European part: Low. Volg., Low. Don., Volg.-Don., Zavolzh.; West. Siberia: Upp. Tob., Alt., Irt.; East. Siberia: Ang.-Sayan.; Len.-Kol.; Centr. Asia: Aral.-Casp., Dzung.-Tarb., Tyan'-Shan., Pam.-Al. Gen. Distr.: Mong., Dzung.-Kashg., Iran. Described from Privolzh'e steppes. Type in Leningrad.

ECONOMIC IMPORTANCE. Readily eaten in early spring and as after-growth in fall. Should be tested in cultivation on solonetz soils.

3. *P. lanuginosa* (Trin.) Nevski comb. nova. -*Elymus lanuginosus* Trin. in Ldb. Fl. Alt. I. (1829) 121; Griseb. in Ldb. Fl. Ross. IV, 332; Kryl. Fl. Zap. Sib. (Fl. of West. Sib.) II, 370. -Ic.: Ldb. Ic. Fl. Ross. tab. 250.

- 715 Perennial. Rhizomes string-like, brown; culms 15-55 cm tall, glabrous and smooth, somewhat hairy only below the spike, slender, enveloped at the base by grayish-brown remnants of old sheaths; leaves glaucous-green, thick-veined, glabrous or pubescent on both sides, the basal leaves subinvolute, much shorter than the culms, culm-leaves broader, 1.5-3 mm broad, flat or nearly so, 2-3 cm long; sheath of the uppermost leaf somewhat inflated. Spikes oblong-ovoid or oblong ellipsoid, 1.5 cm long, 1-1.3 cm broad, villous, with a very brittle rachis; spikelets in 2's-3's, 0.8-1 cm long, whitish- or grayish-green owing to a copious covering of hairs; glumes 0.6-0.7 cm long, setiform, densely clothed with long, strongly spreading hairs; lemmas lanceolate, 0.5-0.8 cm long, densely villous, with awn 1-1.5 mm long. May-June. (Plate L, Figure 5, a-b).

Stony slopes. -West. Siberia: Alt.; Centr. Asia: Aral. -Casp. Endemic. Described from Arkaul' and Dolon-Kara mountains. Type in Leningrad.

Section 3. *Camptolepis* Nevski. -Spikelets 1-flowered, with a rudimentary second floret, or the middle spikelet 2-flowered, the second floret long-pedicelled, neuter. Glumes often long, divergent. Leaves involute, smooth underneath.

4. *P. daghestanica* (Alex.) Nevski comb. nova. -*Elymus dagestanicus* Alexeenko in *Acta Horti Tiflis*. VI, 1. (1902) 97. -*Hordeum daghestanicum* Alex. Sched. Herb. Fl. Ross. IV (1902) 24. -Exs.: HFR No 998.

Perennial. Tufts dense; rhizome short-creeping, oblique; culms numerous, glabrous and smooth, 30-70 cm tall, covered at the base with remnants of old sheaths; leaves grayish-green, very narrow, those of the culm flat, to 3 mm broad. Spikes short-linear, 5-6.5 cm long, 0.8-1 cm broad, pale greenish, very brittle; rachis joints hirsute; glumes subulate-linear, divergent, sometimes slightly curved, (0.9) 1-1.3 cm long, covered with long, spreading hairs, aristate at the tip, scabrous; lemmas 0.7-1 cm long, lanceolate, rather sparsely covered with long hairs, tapering into awn 4-6 mm long. June.

Stony mountain-slopes. -Caucasus: Dag. Endemic. Described from the vicinity of the village Gimra in Avarskii Okrug. Type in Leningrad.

5. *P. rupestris* (Alex.) Nevski comb. nova. -*Hordeum rupestre* Alex. in *Acta Horti Tiflis*. VI, 1 (1902) 96.

Perennial. Culms 30-50 cm tall, glabrous and smooth, slender, enveloped at the base by grayish, subfibrillose remnants of old sheaths. Leaves narrowly linear, ca. 1 mm broad, glabrous, crowded at the base of culms. Spikes cylindrical, 3.5-6.5 cm long, 0.5-0.6 cm broad, light green; rachis joints 2-3 mm long, ciliate on the angles; spikelets 1-1.2 cm long; glumes slender-subulate, slightly shorter than the spikelet, 0.8-1 cm long, scabrous; lemmas lanceolate, obscurely nerved, 0.7-0.85 cm long, tapering into scabrous awn 2-4 mm long, rather sparsely hairy, or glabrescent

716 with sparse hairs only in upper part. June.

Rocky crevices. -Caucasus: Dag. Endemic. Described from surroundings of the village Akush (Dagestan). Type in Leningrad.

6. *P. fragilis* (Boiss.) Nevski comb. nova. -*Hordeum fragile* Boiss. Diagn. ser. 1, VII (1846) 128. -*Elymus fragilis* Boiss. in Kotschy Pl. Pers. (1845); Griseb. in Ldb. Fl. Ross. IV, 330. -Exs.: Herb. Fl. Cauc. No 157.

Perennial. Densely tufted; rhizome short-creeping, oblique; culms curved at the base, 35-60 cm tall, glabrous and smooth all the way up, puberulent only below the spike; leaves glaucous-green, very narrow, those of the culm sometimes flat, to 3 mm broad. Spikelets oblong, broadened toward the top owing to the divaricate awns, pale green, 7-12 cm long, 1-1.5 cm broad excluding the divaricate awns of glumes; glumes very narrow, subulate, very gradually prolonged into long awns, hirsute, 3.5-6 cm long including awns, rather divergent, often subarcuately spreading; lemmas 1-1.4 cm long, lanceolate, sparsely hairy in upper part, prolonged into a scabrous awn 3-5.7 cm long, lemma of the second, infertile floret of the central spikelet to 1 cm long, with awn to 1.7 cm long. June. (Plate L, Figure 7).

Stony slopes, rocks. -Caucasus: South. and West. Transcauc. Gen. Distr.: Arm.-Kurd., Iran. Described from the surroundings of Shiraz. Type in Geneva.

Nevski in Acta Inst. Bot. Acad. Sc. URSS, ser. 1, II (1934).

Spikes dense, enlarged at the top owing to spreading awns, with a firm, continuous, glabrous rachis, bearing a terminal spikelet. Spikelets arranged in 2's, fully sessile, 1-flowered, with a rudimentary second floret. Glumes narrowly subulate, stiff, united at the base. Lemma lanceolate, scabrous, awned, the awns very long, divergent, flattened at the base, scabrous. Annuals.

1. Glumes erect. Awn of lemma stout, 6-10 cm long. Spikes (including awns) only slightly shorter than the remaining part of the culm

. 1. *T. crinitum* (Schreb.) Nevski.

+ Glumes distinctly divaricate and arched-ascending. Awn of lemma more slender, 4-7 cm long. Spike much shorter than the remaining part of the culm 2. *T. asperum* (Simk.) Nevski.

1. *T. crinitum* (Schreb.) Nevski comb. nova. -*Elymus crinitus* Schreb. Besch. Graes. (1772) 15, tab. 24; Griseb. in Ldb. Fl. Ross. IV, 329. -*Hordeum crinitum* Desf. Fl. Atl. I. (1798) 113. -*Elymus intermedius* M.B. Fl. taur.-cauc. I. (1809) 82. -*Hordeum Caput Medusae* β *crinitum* Shmal'g. Fl. II (1897) 666.

Annual. Culms (15) 20-35 (40) cm tall, glabrous and smooth; leaves narrowly linear, to 2-2.5 mm broad, subinvolute, hairy on the upper side, glabrous underneath; sheaths somewhat inflated. Spikes dense, with short rachis joints; spikelets excluding awns of lemmas 2.5-5.5 cm long, green; glumes narrowly subulate, gradually prolonged into a slender, scabrous awn, (1.7) 2-2.7 cm long including awn; lemmas lanceolate, 0.8-1 cm long, obscurely nerved, prolonged into a strap-like awn, very scabrous on the margins, 6-10.4 cm long, 1 mm broad at the base. April-July. (Plate L, Figure 3, a-c).

* From Greek taenia-ribbon, and ather-awn.

Explanation to Plate L.

1. *Aneurolepidium multicaule* (Kar. et Kir.) Nevski: a) spike with a group of 3 spikelets; b) a spikelet; c) glume; d) lemma. -2. *Malacurus lanatus* (Korsh.) Nevski: a) rachis with glumes persisting after shedding of florets; b) spikelet; c) lemma; d) palea. -3. *Taeniatherum crinitum* (Schreb.) Nevski: a) rachis with glumes, florets removed; note rachis surmounted by a terminal spikelet; b) a rachis joint with 2 pairs of glumes; c) lemma. -4. *T. asperum* (Simk.) Nevski: a) rachis with glumes, florets removed; b) lemma. -5. *Psathyrostachys lanuginosa* (Trin.) Nevski: a) rachis joint with 3 pairs of glumes; b) lemma. -6. *P. juncea* (Fisch.) Nevski: a) spike (its top broken off); b) portion of rachis with glumes; c) lemma. -7. *P. fragilis* (Boiss.) Nevski: rachis joint with 3 sessile spikelets. -8. *Cuviera europaea* (L.) Koeler.: a) top of spike with terminal spikelet; b) rachis joint with 3 pairs of glumes; c) lemma. -9. *Critision jubatum* (L.) Nevski: a) spike; b) segment of spike with 1-flowered central spikelet and sterile lateral spikelets; c) lemma. -10. *Hordeum brevisubulatum* (Trin.) Link: segment of spike with 3 spikelets. -11. *H. violaceum* Boiss.: segment of spike. -12. *H. turkestanicum* Nevski, segment of spike. -13. *H. spontaneum* C. Koch: segment of spike.



Stony submontane slopes. -European part: Crimea; Caucasus: South. and East, Transcauc.; Centr. Asia: Upp. Turkm., Pam.-Al., Syr-Dar., Tyan'-Shan., Dzung. -Tarb. Gen. Distr.: Balk.-Asi Min., East, Medit., Arm.-Kurd., Iran. Described from the surroundings of Smyrna.

2. *T. asperum* (Simk.) Nevski comb. nova. -*Cuviera* Caput Medusae var. *aspera* Simk. in Term. Közl. XXIX, Pottf. (1897) 230. -*Elymus asper* H. -Mzt., Eks. austr.-hung. No 3934 -*Hordeum asperum* Deg. in Aschers. et Gr. Synop. II (1902) 744. -H. Caput Medusae Shmal'g. Fl. II (1897) 666.

- 720 Annual. Culms slender, glabrous and smooth all the way up, 15-40 cm tall; leaves narrowly linear, rather involute, more rarely almost flat, to 3.5 mm broad, green, hairy on the upper surface, glabrous or sparsely hairy underneath; sheaths slightly inflated. Spikes dense, 2-4 cm long without the awns of lemmas; spikelets green; glumes narrowly subulate, prolonged into a slender long awn, the total length amounting to 2-3.5 cm; lemmas narrowly lanceolate, 0.65-0.8 cm long, very scabrous all over or mainly on the margins, obscurely nerved, prolonged into a subulate awn, much more slender and delicate than in *T. crinitum*, very scabrous, divaricate, 4-7 cm long. June. (Plate L, Figure 4, a, b).

Dry slopes, fallow lands; sometimes as a weed at roadsides and near cultivated fields. -European part: Prichern., Crimes; Caucasus: Ciscauc., Dag., West, Transcauc.; Centr. Asia: Upp. Turkm., Pam.-Al. Gen. Distr.: Centr. Eur., Balk.-As. Min. Described from Hungary.

Genus 211. CUVIERA* KOELER

Koeler, Descr. Gram. Gall. et Germ. (1802) 328.

Spikes erect, dense, cylindrical, somewhat attenuate toward the top; rachis flexible, continuous, scabrous and hispid on the angles, terminating in a spikelet. Spikelets arranged in threes, short-pedicel, the central spikelet abortive, all green, 1-flowered, with a rudimentary second floret. Glumes linear-subulate, somewhat lanceolately broadened in lower part, connate at the base, 1-nerved, scabrous. Lemmas lanceolate, scabrous, tapering into a slender, slightly curved, scabrous awn. Perennial, sciophilous plants.

1. *C. europea* (L.) Koeler, Descr. Gram. Gall. et Germ. (1802) 328. -*Elymus europeus* L. Mant. I (1767) 35; Griseb. in Ldb. Fl. Ross. IV, 330. -*Hordeum europeum* All. Fl. Pedem. II (1785) 260; Shmal'g. Fl. II 666. -*H. sylvaticum* Huds. Fl. angl. ed. II 1 (1778) 57. -*H. montanum* Schrank, Baier. Fl. I (1789) 386. -Ic.: Host, Gram. I, tab. 28.

Perennial. A bright green plant, tufted, with a short rhizome; culms 60-105 cm tall, hollow, hairy at the nodes, scaberulous below the spike. Sheaths retrorsely hirsute, scabrous; leaves flat, 0.5-1.3 cm broad, thin, bright green, thin-veined, very scabrous on both sides, glabrous or with few scattered hairs. Spikes 5-11 cm long, 0.5-0.9 cm broad; glumes linear-subulate, gradually narrowed into a slender awn, total length amounting to

* Named for the famous zoologist, Georges Cuvier (1773-1832).

1.5-2 cm; lemmas 0.9-1.1 cm long, with awn 2-2.7 cm long. July-August. (Plate L, Figure 8, a-c).

- 721 Shady, deciduous forests. -European part: Upp. Volg. (oak forests in former Likhv. and Kaluzh. Gub.), Mid. Dnep., Crimea; Caucasus: West. Transcauc., Ciscauc., East. Transcauc. Gen. Distr.: Centr. Eur., Scand., Balk.-As. Min. Described from Germany. Type in London.

Genus 212. CRITESION* RAFIN.

Rafin. in Journ. Phys. LXXXIX (1819) 103.

Spikes without a terminal spikelet, very dense; rachis very brittle, ciliate on the angles. Spikelets arranged in threes, the central spikelet with 1 fertile floret and a rudimentary pedicel of a second floret, lateral spikelets pedicellate, with a rudimentary floret. Glumes very slender, capillary, very long, prominently scabrous, spreading. Lemma of the central, fertile spikelet lanceolate, with a very slender, capillary, long awn. Caryopsis narrowly linear, furrowed. Perennial plants.

1. *C. jubatum* (L.) Nevski comb. nova -*Hordeum jubatum* L. Sp. pl. (1753) 85; Griseb. in Ldb. Fl. Ross. IV 329. -*Critesion geniculatum* Rafin. Journ. Phys. LXXXIX (1819) 103.

Perennial. Culms 20-50 cm tall, glabrous and smooth, slender; leaves narrowly linear, to 3.5 mm broad, scabrous on both sides, occasionally hairy on the upper surface, green, longer than the internodes, glabrous and smooth, or the lower ones sometimes hairy. Spikes (2) 3-7 cm long, not taking into account the surrounding awns, and 0.4-0.7 cm broad (excluding the divaricate awns), usually somewhat nodding, light green or somewhat purple-tinged (the awns usually colored in their upper part); glumes (3) 3.5-7.5 cm long, not broadened at all at the base, capillary; lemmas glabrous, 0.45-0.55 cm long, with awn (2) 2.5-9 cm long. July-August. (Plate L, Figure 9, a-c).

Meadows, weedy places. -Arctic: Anad.; European part: as introduced plants in Dv.-Pech. (Arkhangel'sk harbor), Volg.-Kam. (Kazn'), Upp. Volg. (Rybinsk); West. Siberia: Ob. (Tobol'sk. -introduced); East. Siberia: Len.-Kol.; Far East: Kamch., Okhot., Ussur.; Centr. Asia: Pam.-Al. (Samarkand-introduced). Gen. Distr.: N. Am. Described from Canada. Type in London.

NOTE. A perennial plant, although in many floras described as annual. Occurs in Eastern Siberia, as a weed, at roadsides and in weed-infested places, but grows also in meadows in river valleys. In Western Siberia, in the European part of the U.S.S.R., and in Central Asia, it occurs exclusively as a rare, adventive weed.

Critesion jubatum (L.) Nevski $\times$ *Roegneria macrooura* (Turcz.) Nevski. -*Elymus chatangensis* Roshev. in Bull. Jard. Bot.

- 722 Sc. URSS. XXX (1932) 778. -A sterile hybrid, collected on a single occasion by I. P. Tolmachev near Essel Lake, in a weedy place, beside *Critesion jubatum* (L.) Nevski. Spikes brittle, greenish-purple. Spikelets in

* A name representing a neologism, not lending itself to translation.

2's-3's or solitary on very short pedicels, 2-3-flowered or 1-flowered with a rudiment of a second floret; only the first floret more or less fully developed. Glumes linear-subulate, long-awned.

Genus 213. HORDEUM* L.

Gen. pl. (ed. 1, 16) ed. 5 (1754) 37.

Spikes without a terminal spikelet, very dense, rather flattened, with a brittle, more rarely flexible short rachis. Spikelets in 3's, 1-flowered, with a rudiment of a second floret, the central spikelet with a perfect floret, sessile or subsessile, lateral spikelets short-pedicel, reduced or with a staminate floret, rarely all 3 spikelets perfect. Glumes narrow, subulate-setaceous, sometimes lanceolately dilated at the base, erect, lateral. Lemmas of perfect florets usually long-awned. Caryopsis oblong, concave-furrowed on the inner side, usually adnate to lemma and palea. Annual or perennial plants.

1. Perennial plants. Spikes narrowly linear, 0.3-0.8 cm broad. Glumes setiform. (Sect. 1. *Stenostachys* Nevski). 2.
- + Annuals, more rarely perennials, and then culms bulbous at the base. Spikes linear, to 1.5 cm broad. Glumes often lanceolately dilated at the base 7.
2. Lemmas hairy or scabrous, covered over the whole surface with short bristles or hairs 3.
- + Lemmas glabrous, sometimes scaberulous only below the awn . . . 4.
3. Spikes (2) 2.5-5.5 cm long, dark purple or glaucous-purple. Lemmas short-pilose, with awn 1-2 mm long or a very short awn point 5. *H. turkestanicum* Nevski.
- + Spikes 5-10 cm long, green or slightly purple-tinged. Lemmas covered with very short, appressed bristles, the awn 5-9 (10) mm long 2. *H. Bogdani* Wilensky.
4. Spikes light green. Lemmas 0.8-0.9 cm long. Leaves glaucous - or grayish-green, broadly linear, 0.4-1 cm broad, abruptly attenuate 1. *H. boreale* Scribn. et Smith.
- + Spikes purple or greenish-purple. Lemmas 0.45-0.7 cm long. Leaves narrower, 0.1-0.5 cm broad 5.
- 723 5. Awn exceeding its lemma, 0.6-0.8 cm long. Lateral spikelets abortive (mostly reduced to a single glume) 3. *H. sibiricum* Roshev.
- + Awn shorter than its lemma, 0.1-0.3 (0.5) cm long. Lateral spikelets with a reduced or staminate floret 6.
6. Glumes of central spikelet 0.4-0.6 (0.7) cm long, not longer than the floret. Spikes narrowly linear, 0.3-0.5 cm broad 4. *H. brevisubulatum* (Trin.) Link.
- + Glumes 0.5-0.9 (1) cm long, slightly longer than the floret. Spikes 0.4-0.6 cm broad 6. *H. violaceum* Boiss. et Huet.

* Latin name for barley, employed by Virgil.

7. Awn 7-15 cm long, many times longer than its lemma, the awn stout, dilated at the base (Sect. 3. *Crithe* Döll.) 10.
- + Awn shorter (to 3.5 cm), slender, 2-3 times as long as its lemma. (Sect. 2. *Hordeastrum* Döll.) 8.
8. Perennial plants. Culms bulbous at the base 7. *H. bulbosum* L.
- + Annuals. Culms not bulbous at the base 9.
9. Glumes of the central spikelet narrow-setaceous. Spikes slightly compressed or subcylindrical 9. *H. hystrix* Roth.
- + Glumes of the fertile spikelet lanceolately dilated at the base. Spikes laterally compressed; rachis very brittle 8. *H. leporinum* Link.
10. Spikes with a very brittle rachis. Wild-growing plants 10. *H. spontaneum* C. Koch.
- + Rachis continuous. Cultivated plants 11.
11. Lateral spikelets sterile, with a staminate, awnless floret *H. distichum* L.
- + All 3 spikelets perfect. *H. vulgare* L.

Section 1. *Stenostachis* Nevski. -Description in the key.

1. *H. boreale* Scribn. et Smith. U.S. Dept. Agric. Div. Agrost. Bull. No 4 (1897) 24.

Perennial. Culms 20-80 cm tall, geniculate at the base, glabrous and smooth; leaves glaucous- or grayish-green, broadly linear, 0.4-1 cm broad, abruptly attenuate and rather short, glabrous, scabrous. Spikes short-linear, to 5 cm long and 0.6 cm broad, rachis extremely brittle, hispid on the angles; lateral spikelets borne on pedicels to 1 mm long; glumes setaceous, or almost reduced to the awn, scabrous, 0.9-1.4 cm long; lemma of the middle, fertile spikelet lanceolate, obscurely nerved, glabrous, 0.8-0.95 cm long; lemmas of lateral spikelets pedicellate, rudimentary. July.

724 Wet meadows. -Far East: Kamch. Gen. Distr.: Bering., N. Am. Described from Aleutian Islands and Alaska. Type in America.

2. *H. Bogdanii* Wilensky in Izv. Saratovsk. Op. Stan. (Rep. of Saratov Exp. Sta.) 12 (1918) 13.

Perennial. Culms (40)-50-100 cm tall, glabrous, puberulent only at the nodes; sheaths smooth, the lower ones sometimes hairy; leaves glaucous-green, stiff, scabrous on both sides, flat, 0.3-0.8 (1) cm broad. Spikes 5-10 cm long, weakly compressed, 0.5-0.7 cm broad, rachis slightly brittle (especially in lower part), scabrous on the angles; lateral spikelets borne on pedicels 1-1.5 mm long, with a staminate, or perfect, or reduced floret; glumes setaceous, scabrous, 0.7-0.9 cm long; lemmas covered over the whole surface with short, appressed bristles, scabrous, lanceolate, 0.55-0.7 cm long, the awn scabrous, slender, 0.5-0.9 (1) cm long. June-July.

Wet solonchak meadows. -European part: Low. Volg., Zavolzh.; West. Siberia: Upp. Tob., Irt.; Centr. Asia: Aral, -Casp., Pribalkh., Tyan'-Shan. Gen. Distr.: Dzung.-Kashg., Mong. Described from the valley of river Bizyuk (former Novouzenskii rural district). Type in Saratov, cotype in Leningrad.

3. *H. sibiricum* Roshev. in Bull. Jard. Bot. Princ. URSS, XXVIII (1929) 385.

Perennial. Forming small tufts; culms 35-75 cm tall, glabrous and smooth; leaves narrowly linear, 2-4 mm broad, green, scabrous. Spikes 3-7 cm long, 0.3-0.5 cm broad, subcylindrical, purple, rachis brittle in upper part, slightly so in lower part; lateral spikelets rudimentary, nearly obsolete; glumes setaceous, usually exceeding the floret, 0.8-1.2 cm long, scabrous; lemmas narrowly lanceolate, obscurely nerved, entirely glabrous and smooth, faintly scabrous only at the very base of the awn, 0.5-0.6 cm long, the awn scabrous, 0.6-0.8 cm long. July.

Solonetz meadows. -West, Siberia: Alt., Irt., Upp. Tob.; East, Siberia: Daur., Ang.-Sayan. Gen. Distr.: Mong. Described from Siberia. Type in Leningrad.

4. *H. brevisubulatum* (Trin.) Link in *Linnaea* XVII (1834) 391. - *H. secalinum* var. *brevisubulatum* Trin., *Sp. gram.* I (1828) tab. 4. - *H. macilentum* Steud., *Syn. pl. gram.* I (1855) 352. - *Hordeum secalinum* Shmal'g. Fl. II, 666, pro parte.

Perennial. Densely tufted; culms slightly ascending at the base, slender, glabrous, minutely pubescent only at the nodes, 40-80 cm tall; leaves green, narrowly linear, the basal 1-2.5 mm broad, the cauline broader, to 3-4 mm broad, very scabrous on the upper surface and on the margins, scaberulous underneath. Spikes narrowly linear, 4-9 cm long, 0.3-0.5 cm broad, greenish-purple or grayish-purple, rachis hispid on the angles, 725 brittle in upper part of the spike, slightly or scarcely so in lower part; lateral spikelets borne on pedicels 1 mm long, usually with a reduced or staminate floret; glumes setaceous, very scabrous, not exceeding the floret, 0.4-0.6 (0.7) cm long; lemma of the central, fertile spikelet lanceolate, 0.45-0.55 (0.6) cm long, with awn 1-3 (4) mm long, or pointed, obscurely nerved, glabrous, or with very short bristles below the awn. July. (Plate L, Figure 10).

Brackish meadows. -European part: Zavolzh.; West, Siberia: Irt., Alt., Upp. Tob.; East, Siberia: Ang.-Sayan., Daur., Len.-Kol; Far East: Ze.-Bur., Ussur.; Centr. Asia: Aral.-Casp., Pribalkh., Tyan'-Shan., Pam.-Al., Upp. Turkm., Dzung.-Tarb. Gen. Distr.: Dzung.-Kashg., Mong. Described from Bashkiriya. Type in Berlin.

ECONOMIC IMPORTANCE. Produces almost pure swards on brackish meadows, but yields coarse hay of low quality. Should be cut before flowering.

NOTE. Has been confused with European *H. secalinum* Schreb. The latter species is distinguished by long awns and broader spikes; recorded for southern Podoliya, but these records need checking.

5. *H. turkestanicum* Nevski in *Acta Inst. Bot. Acad. Sc. URSS*, ser. 1, II (1934).

Perennial. Densely tufted; culms covered at the base with remnants of old sheaths, slightly curved, glabrous and smooth or puberulent at the nodes, (8) 20-40 cm tall; sheaths of lower leaves densely pubescent; leaves glaucous-green or grayish-green, short-pubescent on both sides, basal leaves crowded at the base of culms. Spikes dark purple or glaucous-purple, very brittle, less so in lower part, rachis ciliate on the angles; lateral spikelets reduced, with a rudimentary floret; glumes setaceous, ciliate-scabrous, 0.55-0.7 cm long, slightly shorter than or as long as the floret; lemma of the central, fertile spikelet lanceolate, hairy, 0.5-0.7 cm long, with awn 1-2 mm long, or pointed. July-August. (Plate L, Figure 12).

High-mountain meadows and stony slopes. -Centr. Asia: Pam.-Al., Tyan'-Shan., Dzung.-Tarb. Gen. Distr.: Dzung.-Kashg. Described from Kal'tauz Pass (Oshskii Raion). Type in Leningrad.

6. *H. violaceum* Boiss. et Huet, in Boiss. Diagn. ser. 1. XIII (1853) 70. -Shmal'g. Fl. II, 666, pro parte. -Exs.: HFR No 1797 (Sub *H. secalinum*).

726 Perennial. Culms glabrous, 30-75 cm tall; leaves green, flat, 0.25-0.5 cm broad, very scabrous, sometimes hairy on the upper surface, relatively thin. Spikes 4-8.5 (10) cm long, 0.4-0.6 cm broad, blackish-purple, more rarely with a fainter purple tinge, rachis scabrous on the angles, very brittle in upper part and slightly so near the base; lateral spikelets reduced; glumes setaceous, very scabrous, 0.5-0.9 (1) cm long, slightly exceeding the floret; lemma of the central, fertile spikelet lanceolate, quite glabrous, 0.5-0.7 cm long, tapering into awn 1-3 (rarely 5) mm long. July. (Plate L, Figure 11).

High-mountain subalpine meadows. -Caucasus: Ciscauc., Dag., East. and South. Transcauc. Gen. Distr.: Iran, Arm.-Kurd. Described from Demavend mountain range (Persia). Type in Geneva.

Section 2. *Hordeastrum* Döll. Fl. v. Baden. (1857) 117. -Description in the key.

7. *H. bulbosum* L. Amoen. acad. IV (1795) 304. -Griseb. in Ldb. Fl. Ross. IV, 328. -Shmal'g. Fl. II, 665. -*H. strictum* Desf. Fl. atl. I (1798) 113. -*H. Kaufmanii* Rgl. in A.H.P. VII (1880) 578. -Ic.: Host, Gram. IV (1809) tab. 12. -Exs.: Herb. Fl. Cauc. No 58.

Perennial. Culms bulbous at the base (to 1.5 cm in diameter), glabrous, smooth, 50-130 cm tall; leaves linear, flat, 0.3-0.7 cm broad, scaberulous, sometimes sparsely covered with long, white hairs on the upper surface. Spikes linear, dense, compressed, very brittle, 6-13 cm long, 0.6-0.9 cm broad; rachis joints reduced in length, hispid on the angles; lateral spikelets borne on pedicels to 1.5 mm long, sterile, with a staminate floret and unequal glumes, one of the glumes setaceous, not dilated at the base and very gradually prolonged into a slender awn, amounting to 1.5-2.7 cm in total length, the other glume narrowly linear-lanceolate at the base, gradually tapering into an awn slightly longer than itself, the length including awn 1.3-2 cm; glumes of the central spikelet equal, both lanceolately dilated at the base, attenuate at the summit into a slender awn, this slightly exceeding the body of the glume, total length amounting to 1.2-1.8 cm (excluding awn 0.5-0.75 cm), 3-nerved, ciliate on the margin; lemma of the central spikelet elliptical-lanceolate, glabrous, 5-nerved, 0.8-1.1 cm long, with a slender, scabrous awn (1.2) 2-3.6 cm long; lemmas of lateral spikelets awnless. May-June.

Mountain slopes and oases. -European part: Crimea; Caucasus: West. Transcauc., Talysh.; Centr. Asia: Upp. Turkm., Pam.-Al., Syr-Dar., Tyan'-Shan. Also recorded by Krylov for West. Siberia: Alt. Gen. Distr.: West. and East. Medit., Balk.-As. Min., Arm.-Kurd., Iran. Described from Italy. Type in London.

8. *H. leporinum* Link in Linnaea IX (1834) 133. -*H. murinum* Griseb. in Ldb. Fl. Ross. IV (1853) 328, pro max. parte; Shmal'g. Fl. II, 665. -*H. ambiguum* Döll. in Mart. Fl. Bras. II (1880) 323. -Ic.: Mart. l.c., tab. 57.

Annual. A light green plant; culms geniculate-ascending, 15-30 (40) cm tall, glabrous; leaves narrowly linear, to 4 mm broad, glabrous, or slightly hairy on the upper surface. Spikes broadly linear, 4-7 cm long; spikelets light green, the lateral ones pedicellate, with staminate florets; glumes of the central, fertile spikelet lanceolately dilated (0.75 mm broad), rather distinctly nerved, scabrous, long-ciliate on the margins, prolonged into a slender awn, 2.75 cm long including awn; glumes of the lateral spikelets unequal, the lower glume (situated on the inside and contiguous with the central spikelet) somewhat lanceolately dilated at the base and ciliate on both sides (more so on the outer side, facing the central spikelet); the upper (outer) glume almost awnlike, devoid of cilia; lemma of the fertile floret broadly lanceolate, ca. 9 mm long, with a straight, scabrous awn ca. 4 cm long; lemmas of staminate florets lanceolate, 1.2-1.4 cm long and 2.5 mm broad, hairy on the inside, glabrous on the back, the awns as long as the lemmas. June-August.

Weedy places, submontane slopes, borders of irrigation canals. - European part: Crimea, Prichern., Mid. Dnep., Low. Volg.; Caucasus: Ciscauc., Dag., West. South. and East. Transcauc., Tal.; Centr. Asia: Upp. Turkm., Kara-Kum., Pam.-Al., Syr.-Dar., Tyan'-Shan., Dzung.-Tarb. Gen. Distr.: West. and East. Medit., Balk.-As. Min., Arm.-Kurd., Iran., Ind.-Him. Introduced in Scandinavia and America. Described from Greece. Type in Berlin.

9. *H. hystrix* Roth, *Catalecta bot.* I (1797) 23. -*H. Gussonianum* Parlat. *Fl. Palerm.* I. (1845) 256. -*H. Winkleri* Hack. in *Oe. B. Z.* XXVII (1877) 49. -*H. maritimum* auct. fl. ross., non With. -Exs.: HFR No 948.

Annual. A grayish-green plant; culms geniculate; ascending, 10-20 cm tall, numerous, glabrous and smooth; sheaths glabrous or, more rarely, puberulent, the upper ones somewhat inflated; leaves narrowly linear, scaberulous, glabrous or hairy. Spikes 2.5-5 (6) cm long, grayish-green; lateral spikelets borne on short pedicels, with reduced florets; glumes of the central spikelet very scabrous, narrowly setiform, long-awned, 1-2 (2.5) cm long with awn; glumes of lateral spikelets subequal, awnlike, the lower glumes (contiguous with central spikelet) scarcely lanceolately dilated at the base; lemma of the central spikelet lanceolate, 5-6 mm long, glabrous, with awn 1.5 cm long. May-June.

Sands and dry clayey slopes. -European part: Crimea, Low.; Caucasus: Ciscauc., Dag., East. and South. Transcauc., Tal.; Centr. Asia: Kara-Kum., Pam.-Al., Tyan'-Shan., Syr.-Dar. Gen. Distr.: Centr. Eur., West. Medit., Atl. Eur., Balk.-As. Min., East. Medit. Described from cultivated specimens. Cotype in Leningrad.

Section 3. *Crithe* Döll. *Fl. v. Baden* (1857) 118. -Description in the key.

10. *H. spontaneum* C. Koch in *Linnaea* XXI (1848) 430. -*H. Ithaburense* Boiss. *Diagn. ser.* I XIII (1853) 70.

Annual. Culms often slightly geniculate at the base, rather stout, hollow, glabrous, 30-75 cm tall; leaves flat, thin, green, very scabrous on both sides; auricles at the base of the leaf blade falcate, pointed, clasping the culm; sheaths glabrous, smooth. Spikes slightly compressed, 2-rowed, light green, rather nodding, 4.5-9 cm long (excluding awns), 0.6-0.8 cm broad, rachis very brittle, densely pubescent on the angles; glumes

linear-subulate, densely hairy, tapering into a slender, scabrous awn, 1.5-1.7 cm long; lemma of the central, fertile spikelet broadly elliptical, 5-nerved, glabrous, prolonged into a flat, very scabrous awn 7-14.5 cm long; lemmas of the lateral, sterile spikelets awnless, rounded-obtuse, linear. April-June. (Plate L, Figure 13).

Semi-desert submontane slopes. -Caucasus: East. Transcauc.; Centr. Asia: Upp. Turkm., Kara-Kum., Syr-Dar., Tyan'-Shan. Gen. Distr.: Balk.-As. Min. (eastern part of the region), East. Medit., Arm.-Kurd., Iran. Described from Shirvan district. Type in Berlin.

* *H. distichum* L. Sp. pl. (1753) 85.

Annual. Culms 50-85 cm tall, erect, smooth; sheaths shorter than the internodes, glabrous; leaves flat, to 1-1.2 cm broad, scabrous on both sides, auricles at the base of the blade falcate, clasping the culm. Spikes linear, to 12 cm long (excluding awns), 0.7-0.8 cm broad, light green, rachis firm, hairy on the angles; spikelets arranged in 3's, in 2 opposite rows; only the central spikelet fertile, sessile, the lateral spikelets short-pedicelled, sterile, with awnless, narrow, rounded-obtuse lemmas; glumes linear-lanceolate at the base, tapering into a slender, scabrous awn, length including awn amounting to 0.9-1.2 cm; lemma of the fertile central spikelet broadly elliptical, glabrous, prolonged into an awn, this very scabrous on the angles, to 15 cm long. June.

A cultivated plant; grown all over the U.S.S.R., but more rarely than the next species, and pure stands of *H. distichum* are infrequent (more often encountered as admixture in fields of *H. vulgare*).

* *H. vulgare* L. Sp. pl. (1753) 84.

Annual. Differs from the preceding species in all 3 spikelets on each joint of the rachis being fertile, each of the spikelets developing a grain; lateral spikelets subsessile. Spikes broader, to 1.5 cm, with a firm rachis, short-pubescent on the angles; glumes linear-lanceolate at the base, short-pubescent, tapering into a slender, scabrous awn; lemmas of lateral spikelets long-awned, the awns flat, very scabrous on the margin, 8-12 cm long, somewhat shorter than the awn of the central floret. June.

One of the most important plants in cultivation. It penetrates farther to the north than any other cereal. All over the U.S.S.R., in agricultural areas.

Spikelets 1-many-flowered, arranged in a panicle or raceme. Glumes often unequal. Lemmas nearly as long as the glumes; palea broad, usually 2-keeled, more rarely keelless, involute or wanting. Lodicules 3, very large, rarely lacking. Stamens 3-6-many. Pistils 2-3. Caryopsis free. Culms ligneous (at least in lower part). Leaves deciduous, articulated on a short petiole.

Tropical and subtropical plants. Only one species of the genus *Sasa* occurs wild in this country, in Sakhalin. A fairly large number of bamboos are cultivated in subtropical parts of the Caucasus, but so far few have become naturalized.

1. Large plants, 6-18 m tall. Culm-sheaths early deciduous (prior to heading). Culms more or less ribbed, with prominent nodes. Sheaths of true leaves very small, forming a glabrous, smooth, semi-transparent scale, tightly clasping the branch. Glumes many-nerved. Stamens 3 *Phyllostachys Sieb. et Zucc.
- + Plants rarely attaining 6 m, resembling reed in appearance. Culm sheaths not deciduous, sometimes persisting in dry state for several years. Culms teret. Sheaths of true leaves rather well developed. Glumes few-nerved. Stamens 3-6 2.
2. The upper part of culm always bearing solitary branches 214. *Sasa* Makino et Shibata.
- + Branches arising in fascicles **Arundinaria* Michx.

Genus 214. *SASA** MAKINO et SHIBATA

Makino et Shibata in Bot. Mag. Tokyo XV (1901) 18, tab. 1.

Plants rarely attaining (in the U.S.S.R.) 3 m in height, producing bushy growth. Rhizome creeping. Culms slender, smooth, to 1 cm in diameter, with internodes 5-10 cm long and slightly prominent nodes; branches arising singly from the nodes, covered by persistent culm-sheaths. Leaves large, broad, with 4-6 pairs of lateral veins, tessellate between the veins. Inflorescence loosely paniculate, branching, borne on solitary branches covered with bladeless sheaths; spikelets 3-13-flowered, narrow, with rather approximate florets. Glumes small, hyaline. Lemmas much longer than the glumes, keelless, many-nerved. Lodicules 3, pubescent on the margin. Stamens 6, rarely fewer. Style short, with 3 plumose stigmas.

- 730 1. Spikelets 10-20-flowered, 2.5-10 cm long. In this country only in Transcaucasia, cultivated *S. japonica* (Sieb. et Zucc.) Makino.
- + Spikelets 3-9-flowered, not exceeding 2.5 cm in length. In this country only in Sakhalin 2.
2. Leaves hairy on the lower side. Inflorescence 8-20 cm long. Spikelets loosely imbricate *S. paniculata* (F. Schmidt) Makino et Shibata.
- + Leaves entirely glabrous. Inflorescence not exceeding 8 cm in length. Spikelets closely imbricate 3.
3. Ligule obsolete. Inflorescence 3-5 cm long. Spikelets to 15 cm long. Lemmas copiously hairy on the margin *S. spiculosa* (F. Schmidt) Makino.
- + Ligule to 2 mm long. Inflorescence 5-7.5 cm long. Spikelets 1.4-2.5 cm long. Lemmas puberulent *S. kurilensis* (Rupr.) Makino et Shibata.
1. *S. kurilensis* (Rupr.) Makino et Shibata in Bot. Magaz. Tokyo XV (1901) 27. - *Arundinaria kurilensis* Ruprecht in Bull. Phys. Math. Pétersb., VIII (1850) 121. - Griseb. in Ldb. Fl. Ross. IV, 395. - *Bambusa*

* Japanese name for a small bamboo.

kurilensis Hack. in Bull. Herb. Boiss. VII (1899) 719. -*Arundo* Donax Georgi, Besch. Russ. Reichs III (1800) 705, non L.

Perennial. Culms 2-2.5 m tall, and to 6.6 mm in diameter; leaves to 13 cm long and 2.5 cm broad, ovate-acuminate, glabrous on the upper surface, with mid-rib prominent on the underside and 6-7 pairs of lateral veins; leaf sheaths glabrous; ligule to 2 mm long. Inflorescence a simple, branching panicle, 5-7.5 cm long, consisting of 4-5 spikelets borne on pedicels 4-9 mm long; rachis hairy; spikelets ovate-lanceolate, 1.4-2.5 cm long, often grayish, closely imbricate, 7-flowered; glumes hairy, the lower ca. 2 mm long, the upper 4-9 mm long, both pointed; lemma ovate, 7-9-nerved; palea 6-9 mm long, 2-nerved; ovary ovoid-oblong. July-August.

Mountain slopes; forming compact thickets. -Far East: Sakh. (Arkaipal, Choinshu Promontory, near Due. Itshara). Gen. Distr.: Jap.-Chin. Described from Kurilian Islands, Urup Island. Type in Leningrad.

S. spiculosa (F. Schmidt) Makino in Bot. Magaz. Tokyo XXVI (1912) 12. -*Arundinaria kurilensis* β *spiculosa* F. Schmidt in Mém. Acad. Pétersb. ser. 7, XII, 2 (1868) 198. -*Bambusa borealis* Hack. in Bull. Herb. Boiss. VII (1899) 720.

Perennial. Culms to 2.5 m tall, ca. 5 mm in diameter, branching in clusters; leaves linear or linear-lanceolate, 10-12 cm long and 1.2-2 cm broad, short-pediceled, hispid on the margin; leaf sheaths glabrous; ligule obsolete. Inflorescence terminal, 3-5 cm long, ovoid, loose, canescent, the pubescent branches each bearing 1-2 spikelet; spikelets 5-9-flowered, somewhat compressed, oblong-linear, to 15 mm long, brownish, with pubescent rachilla; rachilla joints 1/3 as long as the lemmas; glumes unequal, the lower 3-5-nerved, pointed, hairy, often somewhat rudimentary, the upper larger, 7-8 mm long, many-nerved; lemmas ovate, mucronate, rounded on the back, pubescent, especially on the margins; palea as long as the lemma, 2-nerved. July.

Mountain slopes. -Far East: Sakhalin (so far found only in the southern part of the Island). Gen. Distr.: Jap.-Chin. Described from Sakhalin, from Otekhkoro. Type in Leningrad.

S. paniculata (F. Schmidt) Makino et Shibata in Bot. Magaz. Tokyo XV (1901) 25. -*Arundinaria kurilensis* γ *paniculata* F. Schmidt in Mém. Acad. Pétersb., sér. 7, XII, 2 (1868) 198. -*A. paniculata* Makino in Bot. Magaz. Tokyo XVI (1900) 50. -*Bambusa senanensis* Franch. et Sav. Pl. Jap. II (1879) 182, 606. -Ic.: Camus, Monogr. (1913) pl. 2, fig. C. et D.

Perennial. Culms to 2-2.5 m tall and ca. 3-5 mm in diameter, often flattened in upper part; leaves to 30 cm long and 3-5 cm broad, linear-lanceolate, glabrous on the upper surface, hairy underneath, in clusters of 4-5 at the ends of branches; leaf sheaths pubescent on the margin or glabrous; ligule short, obtuse; auricles readily deciduous, hirsute. Inflorescence a contracted panicle, 8-20 cm long, with pubescent branches, each bearing 3-6 spikelets; spikelets linear-oblong or linear, loose, usually purple; glumes very small, the lower subulate, the upper broad, longer, 4-8 mm in length, both hairy; lemmas pointed, 9-11-nerved; palea with 2 ciliate keels. July.

Mountain slopes. -Far East: Sakhalin (so far found only in the southern part of the Island). Gen. Distr.: Jap.-Chin. Described from Sakhalin (village Tunai). Type in Leningrad.

**S. japonica* (Sieb. et Zucc.) Makino in Bot. Magaz. Tokyo XXVI (1912) 13. -*Arundinaria japonica* Sieb. et Zucc. ap. Steud. Syn. pl. gram. (1855) 331. -A. Metake Nichols III. Dict. Gard. 1 (1885) 118. -*Bambusa japonica* Nichols, l.c. -Ic.: Camus, Monogr. (1913) pl. 5, fig. A. pl. 13, fig. a.

Perennial. Rhizome creeping, usually to 2 m long; culms 2-5 m tall and to 4-5 cm in diameter, erect, covered when young with pale yellow culm-sheaths, unbranched in lower part; terminal part of the culm always bearing solitary branches, each with 5-6 relatively large and broad leaves; leaves lanceolate, long-acuminate, short-petiolate, 8-24 cm long and 1.4-2.8 cm broad, with a strong mid-rib and 6-10 pairs of lateral veins. Inflorescence paniculate, lax, containing numerous spikelets; spikelets 10-20-flowered, narrow, subterete, 2.5 cm long, loose; glumes unequal, lanceolate; lemmas lanceolate, 15-nerved, keelless; palea about as long as the lemma, with 2 ciliate keels.

732 Cultivated in this country only in Transcaucasia. Native of eastern Asia, cultivated in West. Europe. Described from Japan. Type in Lenin-grad.

ECONOMIC IMPORTANCE. Used in Japan mainly for basket making and all kinds of wickerwork. In the U.S.S.R. an ornamental plant.

Genus *ARUNDINARIA* MICHX.

Michx., Fl. Bor. Amer. I (1893) 74.

A plant attaining (in this country) 6 m, producing bushy growth. Rhizomes creeping. Culms slender, nodding or creeping, with short internodes and prominent nodes, branches borne in fascicles. Culm-sheaths persistent. Leaves petiolate, small, jointed at the petiole, tessellate. Inflorescence paniculate or racemose. Spikelets 1-many-flowered, rather long, loose; glumes unequal. Lemmas keelless, with numerous nerves. Palea slightly shorter than the lemma, 2-keeled. Lodicule 3, ovate-lanceolate. Stamens 3, rarely 6. Style short, with 2-3 more or less pubescent stigmas.

In this country only cultivated, in the Caucasus (one species).

*A. Simoni A. et C. Rivière in Bull. Soc. Acclim. sér. 3, V. (1878) 774. -*Bambos* Metake Sieb. sec. Camus, Monogr. (1913) 33. -Ic.: Camus, Monogr. (1913) pl. 17, fig. B.

Perennial. Rhizomes very long, penetrating deep into the soil; culms to 6 m tall and to 2 1/3 cm in diameter, erect, strongly branching, with prominent nodes, pruinose; culm-sheaths in the middle part of the culm shorter than the internodes, glabrous, persistent; leaves lanceolate or broadly lanceolate, fairly large, dark green, forming a dense canopy. Never flowers in this country (for description of inflorescence and spikelets, see characters of the genus).

Cultivated in this country in western Transcaucasia. Native of Japan and China, cultivated on a small scale in western Europe.

ECONOMIC IMPORTANCE. Wood not durable, and therefore finds no application in furniture making; used for various small articles, canes, fences, etc.

* From Latin *arundo* - reed.

Genus *PHYLLOSTACHYS* SIEB. et ZUCC.

Sieb. et Zucc. in Abh. Akad. Wiss. Münch. III (1843) 745, tab. 5, f. 3.

Large plants, attaining in this country 18-20 m in height. Rhizome creeping. Culms ribbed, with prominent nodes and relatively short inter-
 733 nodes. Culm-sheaths early deciduous. Leaves with petioles of medium length, tessellate, joined by articulation to the always very small sheaths. Inflorescence a lax panicle, containing few spikelets, surrounded at the base by large, imbricate bracts. Spikelets 1-4-flowered, to 2-3 cm long. Glumes unequal, glabrous. Lemma ovate-lanceolate, pointed. Palea 2-nerved, often with 2 mucros. Lodicules usually 3, lanceolate. Stamens 3. Pistil long, with 3 plumose stigmas. Fruit a true caryopsis.

Occurring in this country only in the Caucasus, along the Black Sea coast, especially in Chakva. It is grown there for industrial purposes, as it provides excellent, light and durable material for light furniture, canes, fishing-rods, various small articles, miscellaneous wickerwork, etc. Flowers very rarely, and dies down after flowering. Seeds never ripen in this country. Since bamboo hardly ever flowers in this country, and recognition of species has to be based on vegetative characters, the following keys and descriptions are based solely on these characters.

1. Culms grayish-tawny or almost black *Ph. nigra* Munro.
 + Culms golden-yellow 2.
- + Culms green 3.
2. Internodes at the base of the culm very short, nearly overlapping . . .
 *Ph. aurea* Carr.
 + Internodes of uniform length all the way up the culm
 *Ph. sulphurea* A. et C. Rivière.
3. Culms dark green, entirely glabrous from earliest age
 *Ph. bambusoides* Sieb. et Zucc.
 + Culms glaucescent, always covered below the nodes, and when young -
 over the whole surface, with a whitish, waxy bloom 4.
4. Culms markedly thickened at the base
 *Ph. mitis* A. et C. Rivière.
 + Culms not markedly thickened at the base 5.
5. Culms-sheaths light yellowish-sandy, not spotted
 *Ph. puberula* (Miq.) Makino.
 + Culm-sheaths rather dark, spotted 6.
6. Culm-sheaths hairless *Ph. Marliacea* Mitf.
 + Culm-sheaths hairy all over . . . *Ph. pubescens* Houz. de Lehaie.

**Ph. bambusoides* Sieb. et Zucc. in Abh. Akad. Wiss. Münch. III (1843) 745, tab. 5, fig. 3. - *Ph. Quiloi* A. et C. Rivière in Bull. Soc.
 734 Acclim., sér. 3 V (1878) 697. - Ic.; Sieb. et Zucc., l.c.; Camus, Monogr. (1913) pl. 27, fig. A, C.

Perennial. Rhizome creeping; culm-sheaths of young growth elongated, to 35 cm long and 7-8 cm broad, reddish-brown, with dark spots and speckles, sparsely hirsute. Culms to 18 m tall, to 8-10 cm in diameter,

* From Greek *phyllos*-leaf, and *stachys*-spike.

dark green, shining, without a waxy bloom; branches paired, canopy usually beginning not lower than half-way up the culm; leaves in clusters of 7 at the end of branches, 15-20 cm long and 2-2.5 cm broad, with brown hairs at the base; petioles short.

Cultivated in this country in western Transcaucasia. Native of Japan, occurs in India (introduced?), cultivated in France and Belgium.

ECONOMIC IMPORTANCE. One of the most valuable bamboos; an erect, slender, nontapering stem, with very hard wood, relatively light and resilient.

*Ph. Marliacea Mitf. Bamb. Gard. (1896) 158. -Ph. bambusoides var. marliacea Makino in Bot. Mag. Tokyo, XIV (1900) 64, XXVI (1912) 21. -Ph. Simonsoni Krassn. Russk. subtropiki (Russian Subtropics) No 4 (1913), p. 34. -Ic.: Bur. Forest. Tokyo, tab. 2, fig. 11-13; tab. 15, fig. 4 (sec. Camus).

Perennial. Rhizome creeping; culm-sheaths purplish, spotted, hairless. Culms to 12 m tall and to 5 cm in diameter, very graceful, erect, always covered with a delicate glaucous bloom which sometimes persists to the following year; grown culms pale green in close plantings and in shade, straw-yellow on the periphery and in the sun; branches paired, subhorizontal; canopy loose, small; leaves in clusters of 4-2 at the end of branches, to 15 cm long and 2 cm broad.

Cultivated in this country in western Transcaucasia. Native of China and Japan, imported to Chavka in 1895.

ECONOMIC IMPORTANCE. The wood of this species is exceptionally hard and durable, stems thick-walled. The canes lend themselves readily to bending over a fire, and hence find wide application in furniture manufacture.

*Ph. puberula (Miq.) Makino in Bot. Mag. Tokyo (1900) 64. -Bambusa puberula Miq. Prolus. fl. Jap. (1865) 173. -Ic.: Camus Monogr. (1912) pl. 28, fig. A.

Perennial. Rhizome creeping; culm-sheaths light sandy-yellow, without any spots. Culms to 15 m tall and 15 cm in diameter, with regularly spaced nodes and a handsome yellow color, more rarely with dark brown spots scattered all over (var. Han-chiku Houz. de Lehaie); canopy always characteristically stratified, with a nodding top; leaves 6-10 cm long and 1-1.5 cm broad, pale green.

Cultivated in this country in western Transcaucasia. Native of China; cultivated in Japan, Indo-China, America, and Europe.

735 **ECONOMIC IMPORTANCE.** Distinguished by very uniform structure and beautiful yellow color of the culms; these are however of limited durability, as the walls are relatively thin; furnishes excellent fishing-rods, canes, and light poles. A shortcoming of this bamboo is a tendency to splinter. The young sprouts are edible.

*Ph. pubescens Houz. de Lehaie in Bull. Soc. Dendr. Fr. (1909) pl. 257, 259. -Ph. edulis Carrière in Rev. hort. (1866) 380. -Ic.: Camus Monogr. (1913) pl. 30, fig. C.

Perennial. Rhizome creeping; culm-sheaths brown with dark brown spots, hairy all over, ribbed. Culms to 15 m tall, strongly tapering, 15-18 cm in diameter in lower part, with short internodes, thick-walled in lower part, with conspicuous scars left by shed culm-sheaths; young culms pruinose, appearing bluish-green; in the second year the bloom persists only below the nodes; all branches paired; the top of the plant always

nodding in the direction of growth of the rhizome; canopy dense, many-layered; leaves at the ends of branches in clusters of 4-5, 8-10 cm long and 0.8-1 cm broad.

Cultivated in this country in western Transcaucasia. Native of China and Japan.

ECONOMIC IMPORTANCE. Characterized by exceptional durability as well as resistance to bending and breaking owing to the thickness of culm walls. Of limited use in the furniture industry on account of the strongly tapering stems. On the other hand, particularly suitable for water pipes, as the ends fit easily into each other without grinding. The short internodes of the lower part of the culm are suitable for manufacture of small articles, such as flasks, vases, etc., particularly since the thick walls enable turning on a lathe. Young sprouts are edible, very nutritious and palatable.

*Ph. mitis A. et C. Riviere, Les Bambous. (1879) 231, pl. 22-23. - Ic.: Camus Monogr. (1913) pl. 30, fig. B.

Perennial. Rhizome long-creeping; culm-sheaths to 30 cm long, somewhat purplish, spotted. Culms to 12 m tall, and to 8 cm in diameter, markedly thickened below, glaucous when young due to a waxy bloom, later light green, dull, strongly branching in upper part; leaves narrow, 8-9 cm long and to 2 cm broad, dark green on the upper surface, glaucous underneath.

Cultivated in this country in western Transcaucasia. Native of China and Japan.

ECONOMIC IMPORTANCE. Less valued than the preceding species, because the walls of the culms are thinner and the wood relatively loose. The canes are, however, very light, and find wide application as barge-poles, cross-beams, etc. Easily split. Young sprouts are eaten like asparagus.

*Ph. nigra Munro in Trans. Linn. Soc. XXVI (1858) 38. - Phyllostachys puberula var. nigra Houz. de Lehaie in Act. Congr. Bruxelles (1910) tab. LII, LIII, LIV. - Ic.: Camus, Monogr. (1913) pl. 26, fig. B.

- 736 Perennial. Rhizome long-creeping; culm-sheaths brownish-gray, reddish-tinged, sometimes spotted, sparsely covered with hairs. Culms to 8-9 cm tall and to 3 cm in diameter, covered with a whitish bloom when young, turning darker with age, first grayish-tawny and dull, finally almost black and shining, unbranched in lower part; leaves 5-12 cm long and 9-12 mm broad, often pubescent.

Cultivated in this country in western Transcaucasia. Native of China and Japan, often cultivated in western Europe.

ECONOMIC IMPORTANCE. Valued principally for its beautiful natural color, flexibility, and ease of working. Does not produce thick canes and is not particularly durable. Mainly used for manufacture of furniture, canes, and umbrella handles; in Japan also used in wickerwork.

*Ph. aurea Carrière in A. et C. Rivière, Les Bambusées (1877-78) 262, fig. 36-37. - Bambusa aurea Hort. ex Riviere, l.c. - Ph. bambusoides var. aurea Makino in Bot. Magaz. Tokyo, XVI (1900) 64. - Ic.: Camus, Monogr. (1913) pl. 33, fig. B.

Perennial. Forming dense thickets; rhizome short-creeping; culm-sheaths purplish, often spotted. Culms to 6 m tall and 4 cm in diameter,

erect, with short internodes, particularly at the base, handsomely golden-colored; leaves linear-lanceolate, to 15 cm long and 2 cm broad, sometimes puberulent.

Cultivated in this country in western Transcaucasia. Native of China and Japan.

ECONOMIC IMPORTANCE. Except for the nodal parts, the wood is of limited durability and tends to crack and split, and therefore not used for furniture. Appreciated mainly on account of the beautiful bright golden-yellow color of the culms and the interesting pattern on the lower part of the culm due to the crowded, swollen nodes. Used principally for manufacture of canes, umbrella handles, fishing-rods, and various other minor articles. Frost-hardy and drought-resistant.

**Ph. sulphurea* A. et C. Riviere, *Les Bambous*. (1877-78) 285.-*lc.*: Camus, *Monogr.* (1913) pl. 32, fig. A.

Perennial. Rhizome creeping; culm-sheaths large, purplish, spotted. Culms in this country to 6 m tall (in countries of origin to 12 m) and 4 cm in diameter, displaying a beautiful bright golden-yellow color from early age, erect, graceful; leaves narrow, to 10 cm long and 2 cm broad.

Cultivated in this country in western Transcaucasia. Native of China and Japan.

ECONOMIC IMPORTANCE. Wood of limited durability. Valued as an ornamental plant. Used almost exclusively for manufacture of walking-sticks. Stands up well to freezing.

(DIAGNOSIS OF NEW SPECIES AND GENERA
MENTIONED IN THE SECOND VOLUME OF THE
FLORA OF THE U.S.S.R.)

Augusto 1934

1. **Sorghum technicum** (Koern.) Roshev. — *Andropogon sorghum* subsp. *sativus* e *technicus* Koern. in Hack. *Andropogon*. (1889) 508. — *Andropogon Sorghum* Brot. var. *technicus* Koern. in Koernicke et Werner Handb. d. Getreidebaues I (1885) 307, 308. — Differt a *Sorgho vulgari* Pers. panicula subnutante, flabelliformi, ramis longis, flexilibus, axem paniculae multo superantibus, palea inferiore aristata, arista 6—10 mm longa.

Spec. typ.: Asia media, Tadschikistania, district. Osch, in valle fl. Ak-bura. 26 VIII 1911. n° 5, leg. B. Fedtschenko et R. Roshevitz.

2. **Sorghum japonicum** (Hack.) Roshev. — *Andropogon sorghum* subsp. *sativus* γ *vulgaris* subvar. *japonicus* Hack. *Andropogon*. (1889) 515. — Differt a *Sorgho vulgari* Pers. panicula erecta, ovata, 15—20 cm longa, ± densa, ramis erectis, spiculis lucide coloratis, gluma inferiore plurinervi, nervis distinctis.

Spec. typ.: China borealis: prov. Kansu orientalis, prope opp. Ling-shou, cultum. 6 X 1884, leg. G. N. Potanin.

3. **Echinochloa macrocarpa** Vasing. (mscr.) — „Annuā, 50—150 cm alta, caespites parvos densos formans, viridula; caules a basi ramosi, crassi, subcompressi, recti, glabri, laeves, nodis inflatis; folia late linearia, usque 1.4 cm lata, longe acuminata, plana, glabra vel sparse pilosa, marginibus scabris; ligula nulla. Panicula 20—25 cm longa, nutans, non densa, disticha, matura contracta; ramis paniculae simplicibus; spiculae 4—5.5 mm longae et 2.5 mm latae, ovato-lanceolatae, per 3 fasciculatae, muticae vel aristatae; gluma prima (inferior) — minute pubescent, trinervia, acuminata, trientem spiculae aequans, gluma secunda — late-lanceolata, scabridociliata, acuminata, spiculam aequans, gluma tertia — secundam aequans, mutica (var. *mutica* Vasing.) vel aristata (var. *aristata* Vasing.), arista 3—5 cm longa; paleae glabrae, nitidae, inferior valde convexa”. (A. Vasinger).

Spec. typ.: Asia media, Tadshikistania, district. Kokand, in oryzetis prope pagum Voruch. 30 VII 1913, leg. Z. Minkwitz.

Differt a *E. crus galli* P. B. spiculis majoribus, 4—5.5 mm longis.

4. **Echinochloa spiralis** Vasing. (mscr.) — „Annuā, 100—120 cm alta, viridula, caespites parvos formans; caules simplices vel paulo ramosi, recti, glabri, compressi, laeves, foliati; folia late linearia, ad 1.5 mm lata, laevia, glabra, marginibus scabris; ligula nulla. Panicula 15—18 cm longa, densa, compacta, multispiculata; rami paniculae non vel paulo ramosi, spiraliter dispositi,

siti, a basi spiculas gerentes; spiculae parvae, 2.75–3.25 mm longae et 1.5 mm latae, muticae, ovato-lanceolatae, binae, pubescentes; gluma prima (inferior) — late-ovata, acuminata, trientem spiculae aequans, dense pubescens, gluma secunda et tertia spiculum aequantes, 3–5-veniae, acuminatae, non aristatae, ± dense scabrido-hirsutae; paleae glabrae, ovato-acuminatae, inferior dorso convexa. (A. Vasinger).

Spec. typ.: Caucasus borealis, ad fl. Kuban, 60 km. NW ab oppid. Krasnodar, inter segetes oryzae originis japonicae, 28 X 1931, leg. A. Vasinger.

Differt a *E. crus galli* P. B. ramis paniculae non ramosis, vel paulo subramosis, spiraliter dispositis, a basi spiculas gerentibus.

5. **Aristida Karelini** (Trin. et Rupr.) Roshev. — *A. pennata* var. *Karelini* Trin. et Rupr. in Mem. Acad. Sc. Pétersb. sér. 6, VII. 2 (1842) 177. — Perennis, 80–150 cm alta, caespites densos formans; rhizoma longe stoloniferum; caules a basi ramosi, glabri; folia anguste linearia, ± setaceo-convoluta. Panicula effusa, ultrapedalis; spiculae fere 2 cm longae, pallidae; glumae inaequales, glabrae, lanceolatae, apice attenuatae et acutae; palea inferior fere 8 mm longa, apice aristata; arista decidua, tripartita; rami aristae fere 2 cm longae, longe plumosae, apice subnudae.

Spec. typ.: Turcomania: loco „Bjely Bugor“, leg. Karelin, in herb. Meyer.

A. pennatae Trin. affinis sed panicula ultra pedali, palea inferiore 8 mm longa et ramis aristae fere 2 cm longis, longe-plumosis, apice subnudis differt.

6. **Stipa armeniaca** P. Smirn. in schedis (descripsit Roshev.). — Perennis, caespites densos formans; culmi 30–50 cm alti, glabri, laeves, pauci; vaginae internodiis longiores, glabrae vel inferiores marginibus ciliatae, vagina superior partem inferiorem inflorescentiae amplectens; folia setaceo-convoluta, glaberrima; ligula ad 1 mm longa, apice obtusa. Panicula angusta, contracta; glumae subaequales, longe acuminatae, 3.5–4.5 cm longae; palea inferior 10.5–11.5 mm longa, callo nonnihil curvato, glabro, in parte inferiore tota superficie hirsuta, supra lineis pilosis 5 aristam non attingentibus notata, sub arista pilis longiusculis coronata; arista 14–18 cm longa, subbigeniculata, inferne torta, superne arcuata, plumosa, pilis in parte inferiore ad 1 mm longis, in parte superiore usque ad 2 mm.

Spec. typ.: Turcia. Distr. Kagysman (olim), in valle fl. Araxis. 2 VI 1913 n° 12588, leg. G. Woronow.

S. Szowitsianae Trin. affinis, sed vaginis internodiis longioribus, laminis glabris, ligula tantum 1 mm longa, glumis 3.5–4.5 (nec 2.5–3.5) cm longis bene differt.

7. **Stipa anomala** P. Smirn. in schedis (descripsit Roshev.). — Perennis, densiuscule caespitosa; culmi 50–60 cm alti, glabri, sub nodis tantum breviter pubescentes; vaginae internodiis paullulum longiores, scabridae, marginibus

eciliatae; laminae anguste lineares, usque ad 2 mm latae, plus minusve convolutae vel planae, scabridae, breviter acuminatae, juveniles apice barbulatae dein glabrae; ligula 0.7—3 mm longa, breviter acuminata. Panicula angusta, contracta plus minusve multispiculata; glumae subaequales, 3—4 cm longae, longe acuminatae; palea inferior 17—18 mm longa, callo nonnihil curvato, glabro, 1 mm longo, in parte inferiore tota superficie pilosa, supra lineis pilosis 7, aristam non attingentibus notata, sub arista ecoronata; arista 20—25 cm longa, bigeniculata, inferne torta, superne arcuato-curvata, plumosa, pilis in parte inferiore 1—4 mm longis, in parte superiore usque ad 7 mm.

Spec. typ.: Prov. Uralsk, distr. Teplovsk, inter pagos Fadulewa et Novenkaja, loco demisso in steppe, 16 VI 1929, leg. N. Rubzow.

Differt a *S. paradoxa* (Junge) P. Smirn. laminis foliorum juvenilibus apice barbulatis (pilis usque ad 3 mm longis) et lineis pilosis marginalibus aristam non attingentibus.

8. *Stipa lithophila* P. Smirn. in schedis (descripsit Roshev.). — *S. pulcherrima* f. *subtilis* Roshev. in sched. — Perennis, caespitosa; culmi 25—40 cm alti, glabri; vaginae internodiis longiores, glabrae vel infimae brevissime puberulae, in statu juvenali marginibus ciliatae; folia setacea convoluta, raro canaliculata, glabra, extus interdum scabridula; ligula oblonga usque ad 2 mm longa. Panicula angusta contracta, ca 10 cm longa; glumae subaequales, longe acuminatae, 4—6 cm longae, palea inferior 16—17 mm longa et nonnihil recurva, callo glabro, infra puberula, supra lineis pilosis notata, quarum 2 marginales aristam attingentes, de tribus dorsalibus mediana collateralium brevior; arista 17—22 mm longa, bigeniculata, in parte inferiore torta, scabrida, statu maturo sicut palea straminea suffusa supra plumosa, pilis ca. 4 mm longis.

Spec. typ.: Tauria, Jaila, m. Demerdshi. 24 V 1905, leg. N. Busch.

A *Stipa pulcherrima* C. Koch statura minore. arista apiculisque brevioribus differt.

9. *Stipa canescens* P. Smirn. in schedis (descripsit Roshev.). — Perennis, caespitosa; culmi 35—45 cm alti, glabri; vaginae internodiis longiores, glabrae vel scabridulae, superior partem inferiorem paniculae subamplectens; laminae setaceo-convolutae vel partim canaliculatae, extus pilis setiformibus adpressiusculis tectae, intus glaberrimae; ligula oblonga, obtusa, 2 mm longa. Panicula angusta, contracta; glumae subaequales, lanceolatae, in aristam tenuem abeuntes, 4.5—6 cm longae; palea inferior 18—19 mm longa, callo glabro, 1 mm longo curvato, inferne circumcirca puberula, supra lineis pilosis notata, quarum marginales aristam attingentes, sub arista ecoronata; arista 27—32 cm longa, bigeniculata, in parte inferiore torta, glabra, sublaevis, supra plumosa, pilis ca 7 mm longis.

Spec. typ.: Transcaucasia: Armenia, in rupestribus prope pagum Elenovka ad ripam lacus Gokcza. 2 VII 1929, leg. O. Zedelmeyer et T. Heidemann.

A. Stipa pulcherrima C. Koch differt laminis extus pilis setiformibus brevibus tectis.

10. *Oryzopsis kokanica* (Rgl.) Roshev. — *Milium caerulescens* *et kokanicum* Rgl. in A. H. P. VII (1880) 644. — Perennis 25—50 cm alta, caespites parvos, densos formans; rhizoma breve repens; culmi tenues, laeves, basi vaginis foliorum $\pm$ obtecti, parte superiore efoliati; folia radicalia involuto-setacea, caulina plana, anguste-lineararia; ligula elongata, ad 5 mm longa. Panicula multispiculata, $\pm$ effusa, ramis laevibus, 8—10 cm longis, per 2—3 in nodis; spiculae lanceolatae, acuminatae, virides, basi $\pm$ atro-violaceae, 6—8 mm longae; glumae subaequales 5—7-veniae; palea inferior chartacea, adpresse pilosa dorso (parte media) glabra, matura nigro-brunnescens, apice aristata; arista recta vel paulo flexuosa, non torta, scabrida, paleam fere, duplo superans, caduca.

Spec. typ.: Asia media: in valle fl. Sarawschan prope Pachud et Warsaminor, leg. O. Fedtschenko.

Differt ab *O. holciformi* (M.B.) Hack. foliis radicalibus involuto-setaceis et palea inferiore adpresse pilosa dorso solum glabra.

11. *Oryzopsis ferganensis* Litw. (Sect. *Piptatherum* Benth. et Hook.) (mscr.). — „Perennis, laxa caespitosa, rhizoma fibrosum. Culmi ca 0.5 m alti, stricti, glaberrimi basi fasciculis foliorum sterilium aucti, usque ad paniculam foliati. Nodi 3—4 vaginis exserti. Vaginae glabrae folio breviores v. eum subaequantes. Ligula 5—6 mm lg., apice truncata v. rotundata, sublacera. Folia plana, ad 10 mm lata, sensim attenuata, acuta, scabrida. Panicula folio saepe suffulta, multiflora, contracta, ad 12 cm lg., ramis scabriusculis binis—ternis, elongatis, apice ramulosis et spiculiferis. Spiculae uniflorae, ca 7 mm lg. Glumae subaequales, dorso convexae, ca 7 mm lg., lanceolatae, acutae, apice violaceae v. pallidae et punctato-scabridae, inferior 7-nervia, superior 5-nervia (v. basi obscure 9-nervia). Flosculi non callosi, lanceolati, 5 mm lg. Palea inferior chartacea, dorso rotundata, obscure 5-nervia, patefacta ovata, florem paleamque superiorem arcte involvens, dorso supra medium adpresse pilosa. Arista apicalis, recta v. paulo flexuosa, non torta, scabrida, ca 8 mm lg., caduca. Palea superior 4 mm lg., caryopsin arcte involvens, superne ad carinam pilosa. Stamina 3, antherae 4 mm lg., antherarum loculi apice barbulati. Lodiculae duae, 1 mm lg., lanceolatae. Ovarium glabrum. Styli 2, stigmata plumosa. Caryopsis sublinearis, basin versus paulo cuneato attenuata, 3 mm lg., antice sulcata“. (D. Litwinow).

Spec. typ.: Asia media. Kirgizstania, in montibus pr. Arslanbob, ad trajectum Kenkol, nec non pr. Taranbazar, leg. D. Litwinow.

Nostra species affinis *O. molinioidi* (Boiss.) Hack., sed differt foliis planis, caespitibus laxis, dimensionibus glumarum alius et paleis obtusis. Ab *O. soongorica* (Trin. et Rupr.) B. Fedtsch. panicula contracta, foliis inferioribus latioribus, flosculis lanceolatis (nec ovatis) et ceteris longe distat.

12. *Oryzopsis latifolia* Roshev. — Planta perennis, interdum caespites parvos formans; rhizomate breviter repente; culmus 70—110 cm altus, robustus, crassus, glaber, laevis; vaginae foliorum internodiis breviores, glabrae, laeves; folia late-lineararia, 6—12 mm lata, longe-acuminata, plana, subtus laevia, supra ad nervos scabrida, radicalia caulinis breviora; ligula ad 5 mm longa. Panicula 12—20 cm longa, plus minusve contracta, multispiculata, rami paniculae scabridi, per 1—2 in nodis, ad 8 cm longi; spiculae semper virides, late lanceolato-acuminatae, fere 8 mm longae; glumae subaequales, membranaceae, obscure 5—7 veniae; palea inferior 5—6 mm longa, late-lanceolata vel ovato-acuminata, chartacea, nigro-brunnescens, adpresse pilosa, tunc demum dorso glabra, apice aristata; arista tenuis, flexuosa, scabrida, non torta, paleam fere triplo, quaduplo superans, caduca.

Spec. typ.: Asia media, Tadshikistania, Distr. Chodshent, prope Ingyrtshak in rupestribus. 8 V 1914, leg. O. Knorring.

Differt ab *O. soongorica* (Trin. et Rupr.) B. Fedtsch. statura robustiore et foliis late-linearibus, 6—12 mm latis.

13. *Oryzopsis kopetdagensis* Roshev. — Planta perennis, caespites densos formans; rhizomate breviter repente; culmus 45—55 cm altus, $\pm$ subadscendens, glaber, laevis; vaginae foliorum internodiis breviores, glabrae, laeves; folia linearia, longe-acuminata, ad 3 mm lata, subtus subscabrida, supra acute-scabrida, basi culmi numerosa; ligula 5—6 mm longa, elongata vel truncata. Panicula 10—15 cm longa, pyramidata vel oblonga, rami paniculae scabridi, per 2 in nodis, ad 8 cm longi; spiculae magnae, 10—12 mm longae, lanceolatae, acuminatae; glumae subaequales, membranaceae, basi virides, parte media lilacinae, apice $\pm$ flavescentes, 5—7-nerviae; palea inferior fere 6 mm longa, chartacea, brunnescens, adpresse pilosa, tunc demum dorso glabra, apice aristata; arista brevis, fere 8 mm longa, recta, scabrida, caduca.

Spec. typ.: Asia media: Turcomania in rupestribus montium Kopetdagh, inter st. Kurt-su et Gaudan. 29 IV 1912. № 2418, leg. W. Lipsky.

Differt ab *O. holciformi* (M.B.) Hack. spiculis majoribus, 10—12 mm longis.

14. *Heleocholea turkestanica* Litw. (mscr.). — „Pusilla, 2—3 cm alta, annua. Radix fibrosa, fibris crispule pilosis. Folia omnia radicalia ad 3 cm lg., 1—1.5 mm lata, antice planiuscula ad apicem convoluta, acutata, viridia, ad marginem et superne ad nervos scabrida, basi in vaginas ca 5 mm lat. margine membranaceas dilatata. Ligula brevissima, lacera. Spicae plures subsessiles, vaginis foliorum basi stipatae. Spiculae uniflorae. Glumae duae aequales, concaviusculae, basi inter se subconnatae, ca 3 mm lg., spatulatae, apice breviter incurvato-acuminatae, margine late auriculato-membranaceae, trinerves, nervis validis superne subconfluentibus, inferne pruinoso-puberulae. Palea inferior 5 mm lg., lanceolata 5-nervia, nervis apice confluentibus, erecta, tubuloso-involuta, basi ventricoso dilatata.

Palea superior anguste lanceolata 4 mm lg., membranacea, glabra. Lodiculae nullae. Stamina 2. Filamenta capillaria, tenuissima ca 4 mm lg. Antherae 0.5 mm lg. Ovarium ovale, apice attenuatum, glabrum, sessile, stylo brevi. Stigmata tenuissima, capillaria, ca 4 mm lg. minutissime pilosella, ex apice floris emergentia". (D. Litwinow).

Spec. typ.: Asia media. Bucharra, ad Kermine in steppis sabulosis. Apr. 16 anno 1895 defl., leg. S. Korshinsky.

Appropinquit ad *H. orientalem* Boiss., tantum e descriptione et tabula mihi notam, sed statura pusilla, glumis apice marginibus late auriculato-membranaceis, paleis glumis fere duplo longioribus, diversa est.

15. *Alopecurus apiatus* Ovcz. (Series *Ventricosae* Ovcz.). — Planta perennis, glaucescens, laxe-caespitosa rhizomate repente et caudiculis sterilibus, ad 30—60 cm alta; culmi a basi vaginis emarcidis tenuibus laxe obtecti, erecti, glaucescentes; vaginae foliorum superiorum plus minusve inflatae, laeves, elongatae; lamina foliorum scabrida plana, subtus laevis, ad 6 mm lt., sensim attenuato-acuminata; ligula oblonga, ad 3 mm lg. Panicula compacta, breviter cylindrica aut ovato cylindrica, villosa, apiato-rubescens, 1.5—4 cm lg., 8—11 mm lata; spiculae 3—5-nae brevissime pedicellatae, ad 4.5—5 mm lg., urceolato-oblongae villosae; glumae in $\frac{1}{4}$ — $\frac{1}{3}$ inferiore connatae acutae, apice rubescentes et divergentes, ad carinas $\pm$ longe ciliatae et caeterum adpresse pubescentes, margine fimbriato-ciliatae; palea inferior glumis brevior vel aequans, acuta, ad carinas et margines in parte superiore brevissime ciliata, ad $\frac{1}{4}$ inferiorem in aristam tenuem geniculatam apice atro-violaceam spicula 2—3 mm longiorem producta; antherae oblongae ad 3 mm lg., flavidae, thecis basi conniventibus.

Habitat in pratis et declivibus lapidosis in regione alpina montium Alaj.

Spec. typ.: Asia media. Fergana, Jugum Alaicum. Prope st. Sary-Tasch, in pratis 3400 m. 2 VI 1901, leg. Alexeenko.

Species *A. ventricosus* Pers. similis, sed statura humiliore, spiculis villosis, violaceis, aristatis etc. differt.

16. *Alopecurus laxiflorus* Ovcz. (Series *Ventricosae* Ovcz.). — Planta plus minusve robusta, ad 100 cm alta, rhizomate repente; folia ad 8 mm lt. scabrida; vaginae longissimae laeves glaucescentes; ligula 3—3.5 mm lg. oblongo-elliptica apice fimbriato-lacerata, truncata. Panicula ad 9 cm lg., cylindrica sericeo-villosa, inferne saepe interrupta, laxa, ramis longis, plurispiculatis; spiculae ad 5—7 mm lg., ovato-oblongae vel ellipticae, sericeo-villosae; glumae ad $\frac{1}{6}$ — $\frac{1}{3}$, saepius connatae, acutae, apice paulo divergentes, ad carinas et nervos marginesque ciliato-villosae; palea inferior glumis longior, anguste-elliptica ad $\frac{1}{6}$ — $\frac{1}{3}$, inferiorem aristam geniculatam, spiculae ad 6 mm longiorem gerens; antherae oblongae ad 3.5 mm lg., thecis basi divergentibus.

Habitat in pratis subalpinis humidis ad 3300 m. s. m. montium Seravshan et Hissar.

Spec. typ.: Asia media: Jugum Seravschanicum, in pratis humidis ad rivulus in decliv. SW m. Much-kua. 2790 m. 21 VII 1932, leg. P. Ovezinikov.

Species haec *A. seravschanico* Ovcz. valde affinis est, sed statura robustiore, paniculis majoribus interruptis, spiculis majoribus longearistatis et glumis apice non divergentibus differt.

17. ***Alopecurus seravschanicus*** Ovcz. (Series *Ventricosae* Ovcz.).—Planta perennis, rhizomate plus minusve repente, plus minusve caespitosa, ad 40—70 cm alta; folia scabrida, plana, 3—7 mm lt.; vaginae glaucescentes, superiores inflatae et saepius laminis subnullis, laeves; ligula ad 1.5—(2) mm lg., convoluta, apice obtuso-rotundata et saepe fimbriato-lacerata, oblonga. Panícula ovato-cylindrica vel oblongo-ovata 3—5 cm. lg. et 11—12 mm lt., cinereo-sericea; spiculae ad 5 mm lg., ovato-ellipticae, villosae; glumae apice rectae non conniventes ima basi connatae, obscure 2-nervatae vix griseo-violaceae, plerumque glumellis longiores; palea inferior oblongo-elliptica, acuta, vix truncata ad carinas, margines nervosque brevissime ciliata ad $\frac{1}{5}$ — $\frac{1}{6}$ inferiorem aristam flexuosam, spicula 3—4 mm longiorem gerens; antherae ad 3.5 mm lg.

Habitat in pratis subalpinis, rarius alpinis montium Pamiro-Alaj ad 3400 m s. m.

Spec. typ.: Asia media: Seravschan. Putschin-Pass. Alt. 2700 m. 24 VIII 1892, leg. V. L. Komarov.

Species nova ab *A. pratensi* L. paniculis brevioribus griseoviolaceis, glumis apice divergentibus, aristis plus minusve flexuosis longioribusque, vaginis inflatis etc. differt. Ab *A. ventricosus* Pers. vaginis inflatis, aristis longioribus etc. bene distincta est.

18. ***Alopecurus pseudobrachystachyus*** Ovcz. (Series *Alpinae* Ovcz.).—*A. brachystachys* Drob. (non M. B.) Якутск.-Майск. тракт (полюс. отчет). (1914) 245. — *A. glaucus* V. Petr. (non Lessing). Фл. Якутии. I (1930) 146. — Planta perennis ad 90—100 cm alta; folia ad 20 cm lg. et 3—4 mm lt. plana, scabrida, saepius conduplicata; vaginae caulos dense amplexantes, laminis foliorum breviores, laeves; ligula ad 3 mm lg., apice rotundata. Panícula compacta, brevi-cylindrica, violaceo-griseo-viridis ad 4.5 cm lg. et 7—8 mm lt.; spiculae 2—3-ni ad 4—4.5 mm lg., oblongo-ovatae, dense villosae, griseo-virides aut glaucescentes; glumae apice atroviolaceae, acutae, villosae, in parte $\frac{1}{4}$ connatae; palea inferior glumis aequans, rarius brevior aut longior acuta glabra aut in parte superiore vix puberula, ad $\frac{1}{3}$ inferiorem aristam vix flexuosam aut unigeniculatam scabriusculam spiculae 1.5—3 mm longiorem gerens; antherae ad 1.5—2.3 mm lg., oblongae.

Habitat in paludibus et pratis turfosis et in fruticetis in Sibiria orientali.

Spec. typ.: Asia orientalis. Reg. Amurensis in prato fluminis Dochtnak (affluens fl. Zeja) prope Ulanga. 30 V 1916, leg. I. Bobrov.

Ab affini specie *A. brachystachyo* M. B. paniculis minoribus, aristis brevioribus et glumis differt.

19. ***Alopecurus Roshevitzianus*** Ovez. — *A. alpinus* var. *elatus* Roshev. [non Kom.] in Фл. Азиат. Росс. Сер. I. 2. IV (1924) 221. — Planta perennis ad 60 cm alta, rhizomate repente; folia ad 3–5 mm lt; ligula longe-oblonga, ad 4 mm lg; caules tenues, apice plus minusve debiles. Panicula elongata, plus minusve laxa, ad 4 cm lg, griseo-sericea vel sericeo-villosa; spiculae anguste ellipticae; arista plus minusve longa, recta, ad 3–4 mm lg.; palea inferior obtusiuscula glumis aequans; glumae acuminatae erectaeque aut apice vix divergentes; antherae anguste-oblongae ad 3 mm lg.

In declivibus pratensibus et pratis humidis paludibusque.

Spec. typ.: Sibiria orientalis, Regio Kolymaensis, inter Pochodskoje et Panteleevskoje, in declivibus fl. Kolyma. 28 VII 1905. № 1396, leg. I. Schulga.

Ab *A. tenui* Kom. foliis latioribus longioribusque, caulibus elongatis et debilibus, ligulis elongatis, paniculis elongatis, aristis longioribus etc. differt. Ab *A. boreali* Trin. vaginis paulo inflatis, foliis et caulibus longioribus etc. bene differt.

20. ***Agrostis anadyrensis*** Soczava (mscr.). — „Perennis, laxe caespitosa, multicaulis; caules erecti, 35–40 cm alti; folia omnia plana, glabra, 10 cm alta, 3–4 mm lata; vaginae ima basi integrae ceterum fissae, glabrae; ligulae longae, ad 2–3 (3.5) mm altae, apice rotundatae, multifissae. Panicula coarctata, 10–15 cm longa, ramulis tenuissimis, scabris; spiculae uniflorae, 2–5 mm longae, glumae viridi-violaceae, obovato-ellipticae, glabrae, ad nervum scabrae, glumis inferioribus 2.5 mm longis, superioribus 2 mm longis, paleae glabrae, pallidae, glumis paullo breviores; arista geniculata vel subgeniculata ad medium dorsi paleae inserta, paleam paullo superans (1–1.5 mm); antherae pallide flavae ad 0.6–0.7 mm longae“. (V. Soczawa).

Spec. typ.: Sibiria orientalis: Regio Anadyrensis. In ripa fl. Belaja in fl. Anadyr a sinistra influentis (ad radicem mont. Bitzo, 4 VIII 1929, leg. V. Soczava.

Differt ab *A. Trinii* Turcz. foliis latioribus, panicula contracta, ramulis scabrido-pubescentibus.

21. ***Agrostis macrantha*** Schischk. (Subgen. *Vilfa* (Adans.) Rouy, Flore de France XIV (1913) 60). — Gen. *Vilfa* Adans. Fam. II (1763) 495. — Rhizoma tenue, radices tenues numerosas emittens. Culmi basi adscendentes, geniculati, glabri, 30–40 cm alti; folia linearia, longe acuminata, plana, 8–13 cm longa et 2.5–5 mm lata, scabriuscula; ligulae foliorum superiorum acutae, 5–6 mm longae. Panicula contracta, densiuscula, 10–13 cm longa et 2–4 cm lata, axi principali glaberrimo; ramuli scabridi, stricti, infimi septeni, superiores 2–3-ni spiculis a basi insidentibus; glumae pallide virides, lanceolatae, tenuiter acuminatae, dorso vix scabridulae, ad carinam in parte superiore scabridae, 3.5 mm longae, subaequales; palea inferior

2.2 mm longa, sub apice arista recta, 1 mm longa aucta, palea superior 1.4 mm longa. Antherae lineares, 1.2 mm longae.

Spec. typ.: Caucasus, inter sinum maris Nigri Gelendzhik et opp. Gelendzhik, in silva 21 VII 1912, leg. I. Pilibin.

Species haec appropinquat ad *A. hissaricam* Roshev. sed panicula contracta, albido-virenti (nec diffusa, violaceo-colorata) et ramulis vix (nec valde) scabridis bene differt. Affinis atque *A. Paulseni* Hack. sed glumis majoribus, 3.5 mm longis (nec 2.5 mm), aristis brevioribus, diversa est.

22. *Agrostis jacutica* Schischk. (Subgen. *Vilfa* (Adans.) Rouy l. c.) — *A. stolonizans* V. Petr. in Fl. Jacutiae I (1930) 177, fig. 58 non Bess. — Rhizoma culmos floriferos paucos et turiones numerosos steriles caespites formantes emittens; culmi floriferi erecti vel a basi adscendentes, 20—30 cm alti; folia anguste linearia, longe acuminata, ad 5 cm longa et 1 mm lata; ligula foliorum superiorum oblonga, acuminata, 2 mm longa. Panicula ovato-elliptica, 4 cm longa et 2 cm lata, axi principali glabra, ramulis scabridiusculus; glumae purpureo-coloratae, elliptico-lanceolatae, acutiusculae subaequales, 1 1/4 mm longae; inferior ad carinam in parte superiore scabra; palea inferior vix glumis brevior, nervo mediano in aristulam brevissimam producta; palea superior tertiam partem inferioris aequans; antherae oblongo-ovatae, 0.6 mm longae, flavescentes.

Spec. typ.: Sibiria orientalis. Jacutia, Inter Jakutsk et Viljujsk. Lacus prope stationem Byrylchskaja in trunco putrido natante. 3 VIII 1912, fl. leg. R. Abolin.

23. *Calamagrostis hissarica* Nevski (mscr.). — Subhumilis, glumis ovatis, rachilla infra glumellam glabram callosa breviter pilosa, pilis glumella triplo-quadruplo brevioribus, palea ovata glumella duplo brevior, antheris breviter linearibus. — Planta dense caespitosa, culmis 15—40 cm altis glabris nodis atratis, foliis anguste linearibus ad 1.5 mm latis, viridibus, scabris (praesertim in margine), ligula 0.75—1.5 mm longa, obtusa interdum bifida, apice subciliolata, panicula erecta, 3—8 cm longa, angusta, post anthesin contracta, ramis erecto-patulis, inferioribus 1—5 inaequilongis tenuibus, pedicellis spicularum scabriusculis, setulis perparvis numerosis adpressis vestitis, apice (sub spicula) incrassatis, glumis subaequalibus, violaceo-coloratis, ovatis 2 mm longis, carinatis superne ad carinam breviter ciliato-scabris, acutis, muticis, rachilla infra paleam inferiorem callosa, calli pilis copiosis, palea inferiore glabra scabriuscula triplo-quadruplo brevioribus undique conformibus, palea inferiore ovata hyalina, 1.75—2 mm longa quinquinervi, nervis duobus marginalibus scabris, in aciculas breves 0.15—0.2 mm longas scabras productis, nervis duobus, interioribus multo minus conspicuis in aciculas brevissimas fere obsoletas protractis, nervo medio in aristam scabram flexuosam demum subdivergentem aliquanto infra medium paleae inferiores insidentem palea inferiore subduplo longiorem abeunte, palea superiore hyalina ovata palea

inferiore duplo brevior 1 mm longa obtusa binervi, antheris circ. 0.7 mm longis, caryopside flava palea vix longiore. (S. Nevski).

Spec. typ.: Asia media in montibus hissaricis in pratis alpinis humidis prope trajectum Ak-tasch, alt. 3000 m. Legerunt 28IX 1933 G. Grigorjev, A. Koroleva et V. Nikitin, n° 75.

Species distinctissima. A *C. agrostiformi* Roshev. palea superiore ovata, palea inferiore glabra duplo brevior et calli pilis brevioribus differt.

24. *Calamagrostis Ruprechtii* Nevski (mscr.). — *Calamagrostis Buschtana* var. *glabrata* Litw. in Journ. Soc. Bot. Russ. XI (1926) 252. — „Humilis, glumis ovatis, rachilla infra glumellam glabram callosa longe pilosa, pilis glumella subbrevioribus, palea lanceolata glumellae fere aequilonga, antheris ovatis. — Planta dense caespitosa, culmis 7—18 cm altis, tenuibus, glabris, foliis anguste linearibus ad 1.75 mm latis, viridibus scabriusculis (praesertim supra et in margine), ligula 1—2.5 mm longa, obtusa in lacinias ciliolatas fissa, panícula erecta 1.5—7 mm longa, angusta, post anthesin contracta, ramis erecto-patulis inaequalibus tenuibus scabriusculis inferioribus 1—3, pedicellis spicularum scabris, apice leviter incrassatis, glumis subaequalibus violaceo-coloratis 2 mm longis, ovatis, carinatis, superne ad carinam breviter ciliato-scabris muticis acutis, rachilla infra paleam inferiorem callosa, calli pilis copiosis palea inferiore glabra scabriuscula vix brevioribus undique conformibus inter se subaequalibus, palea inferiore ovata hyalina 1.75 mm longa, quinque-venis duobus marginalibus scabris, in aristulas breves 0.25—0.4 mm longas, scabras, productis nervis duobus interioribus multo minus conspicuis, in aciculas brevissimas fere obsoletas protractis, nervo medio in aristam scabram flexuosam vel subrectam aliquanto infra medium paleae inferioris insidentem palea inferiore subduplo superantem abeunte, palea superiore lanceolata hyalina palea inferiore paulo brevior binervi, antheris ad 0.4 mm longis, caryopside 1 mm longa, flava, ovata“. (S. Nevski).

Ab affini *C. olympico* Boiss. paleis glabris, scabriusculis (nec pilosis) differt.

Spec. typ.: Caucasus: in Daghestania australi in alpinis ad originem Djultu-Tschai confluvii Samuri, alt. 1400—1430 m. s. m. 1860 Jul. 18 et 22, legit F. Ruprecht.

25. *Calamagrostis trichantha* Schischk. (mscr.). — *Agrostis lazica* Zedelm. in sched. non Bal. — „Perennis, caespitosa; radix fibrosa; culmi erecti 8—17 cm alti, tenues, basi foliorum fasciculis circumdati; folia plana, anguste linearia vel linearia, acuminata, viridia, 2—4 cm longa et 0.5—2.5 mm lata, tenuissime scabridula, ligula oblonga obtusa in lacinias interdum fissa, 1.5—2 mm longa. Panícula angusta, 2—4.5 cm longa, 0.5—1 cm lata, ramis brevibus, strictis, vix. scabridulis; glumae subaequilongae, lanceolato-oblongae, acutae, 2 mm longae, purpureae vel fusco-purpureae, inferior in parte superiore ad carinam scabrida; palea inferior ad 1.5 mm longa, dorso longiuscule et parce pilosa, apice breviter triseti, infra medium dorsum arista subincurva

exserta, 2 mm longa instructa. Calli pili copiosi, dimidiam paleam subaequantes, palea superior anguste lanceolata, acuta, 1 mm longa, antherae lineares 0.5 mm longae, flosculi steriles rudimentum nullum. Lodiculæ 2, lineari-lanceolatae". (B. Schischkin).

Spec. typ.: Transcaucasia: Armenia, distr. Nor-Bajazet. In monte Archaschin, leg. O. Zedelmejer et T. Hejdemann.

Nostra species affinis est *C. olympicae* Boiss., sed differt pilis calli dimidiam paleam aequantibus (nec eae aequilongis), et pilis dorso paleae inferioris brevioribus sparsioribusque.

26. **Calamagrostis Alexeenkoana** Litw. in sched. (descripsit Roshev.). — Perennis, rhizome breve repens, dense caespitosa; caules ca 60 cm alti, simplices, erecti, glabri, basi vaginis foliorum vetustorum muniti; laminae lineares, longe acuminatae, scabridulae, planae vel interdum vix convolutae; ligula usque ad 5 mm longa, lacera. Panicula ad 15 cm longa, oblonga, densa, contracta, ramulis 6 cm longis, acute scabris; spiculae anguste lanceolatae, 5—6 mm longae, glumae anguste lanceolatae, subaequales, toto dorso pilis rigidiusculis brevissimis tectae; palea inferior 4 mm longa, angusteanceolata, apice bidentata, arista recta ca 5 mm longa infra incisuram dentium orta calli pili flore paulo longiores, rudimentum parvum ca 0.3 mm longum, subglabrum.

Spec. typ.: Asia media. Tozdumbasch-Pamir, im valle fl. Kara-czukur, alt. ca 3.400 m 18 VII 1901, leg. Alexeenko.

Species haec differt a *C. lanceolata* Roth habitu alieno, arista longiore, a *C. Korshinskyi* Litw. praesertim loco insertionis aristae.

27. **Calamagrostis czukezorum** Soczawa (mscr.). — „Perennis, rhizoma tenue repens, culmi solitarii teretes, laeves, sulcati ad 28—35 cm alti, 1—1.5 m lati; folia caulina angusta et brevia (5 cm), glabra; vaginae fissae, glabrae et laeves; ligulae breves, truncatae, apice fimbriatae. Panicula macilenta laxiuscula nunquam patula ad 6 cm longa, 1.5 lata; ramuli flexuosi, patuli scabri sub anthesi rachide subappressi; spiculae minutae, pallidae, glumae 2.5 mm longae fere aequilongae, tota superficie glaberrimae, ad nervum medium apice scabrae; paleae inferiores glumarum fere longitudine, vel paullo breviores, glabrae et laeves apice bidentatae; arista ad vel infra medium dorsi paleae inserta, paleae aequilonga; paleae superiores glabrae, 2 mm longae; calli pili sparsi flore fere aequilongi, vel paullo superantes. Antherae 1.1—1.2 mm longae". (V. Soczawa).

Spec. typ.: Asia orientalis. Regio Anadyrensis. Betuletum herbosum in ripa fl. Belaja (in fl. Anadyr a sinistra influentia) 31 VII 1929.

Differt a *C. kolymensi* Kom. culmis solitariis, panicula laxiuscula et spiculis duplo minoribus.

28. **PAPPAGROSTIS** Roshev. Gen. nov. — Panicula linearioblonga, contracta, densa, subspiciformis. Spiculae lineari-lanceolatae, uniflorae, flosculo

hermophrodito, rhachilla haud ultra florem producta. Glumae steriles subaequales, flosculo longiores. Gluma fertilis herbaceo-membranacea, bifida, inter lacinias aristata, circa incisuram corona pilorum ornata. Palea glumam aequans, minutè bidentata, bicarinata, carina pilosula. Lodiculæ minutæ Stamina 3, antheris linearibus. Ovarium glabrum; styti obsoleti, stigmata linearia, angustissime plumosa, ex apice floris clausi exserta.

Area geographica: Asia centralis.

Generis typus: *Pappagrostis pappophorea* (Hack.) Roshev. — *Calamagrostis pappophorea* Hack.

Differt a genere *Calamagrostis* Adans. palea inferiore herbaceo-membranacea, bifida, inter lacinias aristata, circa incisuram corona pilorum ornata.

29. **Vahlodea paramushirensis** (Kudo) Roshev. — *Deschampsia atropurpurea* var. *paramushirensis* Kudo in Journ. Coll. Agr. Hokkaido Univ. Sapporo XI.2 (1922) 71.

Planta perennis, 15—40 cm alta, rhizomate breviter repente, interdum caespites parvos formans; culmus erectus, glaber; folia anguste linearia 2—5 mm lata, plana, utrinque sericeo-pubescentia; ligula fere 2 mm longa. Panicula diffusa, 7—12 cm longa; rami paniculae ± pubescentes, praesertim in parte superiore; spiculae fere 5 mm longae, virides vel ± violaceae; glumae late lanceolatae, acuminatae; palea inferior fere 2—2.5 mm longa, ± acuminata, basi pilosa, pilis $\frac{1}{2}$ ejus non attingentes. Arista glumam non superans. In pratis.

Spec. typ.: Asia orientalis. Kamtschatka, ad trajectum Kronotsky in vicinitate lacus Kronotsky in pratis subalpinis. 10 VIII 1909, leg. V. Komarov.

Differt a *Vahlodea atropurpurea* (Whlbg.) Fr. foliis holosericeis pubescentibus non glabris vel subglabris, et basi paleae inferioris pilis praedita $\frac{1}{2}$ ejus longitudinem non attingentibus.

30. **Deschampsia borealis** (Trautv.) Roshev. — *Deschampsia caespitosa* var. *borealis* Trautv. in A. H. P., I (1871) 86. — Planta perennis 10—25 cm alta caespites parvos formans; culmus ± adscendens, tenuis, glaber; folia radicalia abbreviata, plana, vel ± longitudine plicata. Panicula effusa, ovata vel ± contracta, rami paniculae non longi; spiculae parvae, 3—4 mm longae, 2 (—3)-florae, rhachides ± pilosae; glumae paulo inaequales, apice ± denticulatae; palea inferior anguste-lanceolata, basi pilosa, pili $\frac{1}{4}$ — $\frac{1}{3}$ ejus longitudinem attingentes, dorso aristata; arista recta, spiculam ± aequans, fere a medio vel paulo infra medium exserta.

Spec. typ.: Sibiria borealis. Ad fl. Taimyr. 1843, leg. A. Middendorff.

Differt a *Deschampsia caespitosa* (L.) P. B. statura graciliori et arista fere a medio dorso paleae inferioris exserta.

31. **Deschampsia pamirica** Roshev. — *D. caespitosa* var. *pamirica* Roshev. in schedis. — Planta perennis 65—80 cm alta, caespites parvos, densos, formans; interdum rhizomate breviter repente; culmus erectus vel paulo adscen-

dens, tenuis, glaber, laevis; folia anguste-linearia, 2—4 mm lata, plana vel $\pm$ longitudine convoluta, infra laevia, supra paulo scabrida, ad basin caulis congesta; ligula acuminata, 5—8 mm longa. Panicula 10—15 cm longa, oblonga aurea; rami paniculae laeves, ad 5 cm longi; spiculae 4—7 mm longae, 2—3-florae, rhachi sparse villosae; glumae 4—5 mm longae, subaequales, apice $\pm$ breviter denticulatae; palea inferior anguste-lanceolata, apice irregulariter denticulata, basi pilosa, pili $\frac{1}{2}$ — $\frac{1}{3}$ ejus longitudinem attingentes, fere a medio dorso aristata; arista recta, palea brevior interdum rudimentaria vel absens; palea superior anguste-lanceolata, bicarinata.

Spec. typ.: Asia media. Pamir ad fl. Kirghiz-su ad pagum Irch. 19 VIII 1897, leg. S. Korshinsky.

Differt a *Deschampsia caespitosa* (L.) P. B. arista palea brevior vel subnulla, foliis radicalibus numerosis et panicula aurea.

32. **Phragmites serotina** Kom. — Rhizoma repens; stolones epigaei longissimi, nodis radicanibus, internodiis viridibus vel violaceis; culmus 1—2 m altus, mediocris; folia 1—2 cm lata, apice longiter sensim angustata (fere caudiformia), marginibus scaberrimis, ligula saepe nulla, rarius adest callus annulatus pilis coronans, $\pm$ calvenscens. Panicula saepius inops, 15—20 cm alta, 5 vel ultra cm lata (angusta); spiculae sordide violaceae 3—5 flores, minus quam 1 cm lg., glumae paleaequae tenues, carinis et venis parum evolutis in genere laevioribus, glumae 3—5 mm lg., paleae usque 6 mm lg., apice breviter subulatae.

Ad ripas limosas vel glareosas fluviorum gregatim occurrit in regione omni a lacus Chan-hai meridiem versus. Floret saepius ab initio septembri mensis.

Spec. typ.: Asia orientalis. Prov. Austro-Ussuriensis, ad ripas fl. Sidiemi (Siao-demi) in districtu Possiet 21 IX 1933, leg. V. L. Komarov.

Differt a *Ph. communi* Trin. spiculis duplo minoribus, pedicellis fere capillaribus, paleis sublaevibus, foliis laete viridibus angustioribus, stolonibus epigaeis. Pertinet ad conspeciem vel speciem collectivam *Ph. japonicam* Steud. precipue proxima *Ph. prostrato* Makino differt autem paleis angustioribus apice subulatis.

33. **Diplachne bulgarica** (Bornm.) Roshev. — *Diplachne serotina* subsp. *bulgarica* Bornm. Bot. Centralbl. XXXVI (1888) 156. — Planta perennis, caespites parvos formans; rhizomate breviter repente, tenui, sine stolonis; culmus ad 60 cm altus, tenuis, fere, 1 mm crassus, glaber, laevis, saepius rubro-violaceus; folia anguste-lanceolata, acuminata, $\pm$ longitudine plicata, marginibus scabride-acuta; ligula brevissima, minute-ciliata. Panicula ad 8 cm longa, paucispiculata, saepius contracta; spiculae 6—8 mm longae, 1—3-florae, virides vel $\pm$ griseae; glumae 2.5—4.5 mm longae, inaequales; palea inferior anguste-linearis, tenuiter acuminata, in aristam ad 2 mm longam transiens, basi fere glabra marginibus glabra, vel parce hirsuta.

Spec. typ.: Caucasus. Prov. Dagestan, district. Temir-Chan-Schura, prope et st. Temirgoje. In aridis ammoniacis. 25 VIII 1899, leg. Th. Alexeenko.

Differt a *Diplachne serotina* Link. rhizomate sine stolonibus et foliis $\pm$ longitudinaliter plicatis.

34. *Diplachne songorica* Roshev. — Planta perennis, caespites densos formans, rhizomate breviter repente; culmus 20—25 cm altus, glaber, laevis basi turionibus brevibus numerosis circumdatus; folia linearia, longe-acuminata, ad 2 mm lata $\pm$ involuta, rigida, paulo scabrida; ligula brevissima, apice ciliata, lateribus ad basin pilis longis, mollibus, praedita. Panicula 2—4.5 cm longa, effusa, paucispiculata; spiculae parvae, 3—5 mm longae, 2—5-florae, $\pm$ violaceae; glumae inaequales, 1.5—3 mm longae, subhyalinae; palea inferior lanceolata, glabra vel partim minute-puberula, mutica vel acuminata; palea superior bicarinata, inferiorem $\pm$ subaequans, carinis ciliolatis.

Spec. typ.: Kasakstania orientalis. Districtus Dscharkent in montibus Kopaly inter fluvium Tscharyn et fluvium Schilik. 17 VIII 1908, leg. M. Ptaschitzky.

Differt a *Diplachne serotina* Link ligula a basi longe pilosa inferiore mutica vel acuminata, non aristata.

35. *Melica canescens* (Regel) E. Lavrenko (Sect. *Beckeria* Aschers., Series *Cupanianae* E. Lavrenko). — *M. Cupani* β *canescens* Regel. Descr. pl. nov., fasc. 8 (1880) 627. — Perennis, 15—45 cm alta, canescens, caespites formans; culmi numerosi, erecti vel paulo adscendentes, tenues, glabri vel in parte superiore (sub panicula) scabrido-pubescentes, foliati; vaginae foliorum dense et molliter pilosae; laminae foliorum lineares, dense et molliter pilosae, convolutae vel rarius plus minusve planae; ligula ad 2.5 mm longa, apice lacinata. Panicula ad 3.5—6 (—13.5 cm) longa, secunda, compressa, plus minusve densa, rarius laxa; spiculae ad 6—7 (—8) mm longae, reclinatae; glumae lanceolatae, acutae, plus minusve violaceae, rarius pallidae; gluma inferior superiore $\frac{1}{2}$ vel rarius dimidio brevior; palea inferior dorso a basi ad apicem undique longe et dense villosa. V—VII.

Spec. typ.: Asia Media (Turkestan). Basmandinsk, 1000—1500 m. 1 VII 1870, leg. O. Fedtschenko.

Differt a *M. Hohenackeri* Boiss. et *M. breviflora* Boiss.: canescens, culmus in parte superiore pubescens, vaginae et laminae foliorum pilosae.

36. *Dactylis Woronowi* Ovcz. — *D. glomerata* β *hispanica* Griseb. (non Roth.) in Ldb. Fl. ross. IV (1853) 369. — Planta perennis ad 40—50 cm alta, densissime caespitosa; folia aspera, rigidula, conduplicata. Panicula secunda compacta, oblonga; spiculae ad 5—6 mm lg., 4—6 flores; gluma inferior carinata, mucronato-apiculata, apice anguste emarginata in emarginatura aristam rigidam producens, ad carinas longe-ciliata, caeterum glabra vel sparse puberula; antherae ad 2.5 mm lg. mm lg., thecis basi paulo divergentibus.

Habitat in declivibus et pratis siccis montium Transcaucasiae et Kopet-Dagh.

Spec. typ.: Asia media. Turcomania, prope Aschabad 1898 № 2199, leg. D. Litvinow.

A. D. glomerata L. statuta humiliore, paniculis contractis et glumis apice emarginatis etc. differt.

37. *Poa bacuensis* Litw. (mscr.). — „Laete viridis, rhizoma caespitosum, fibriferum, culmis crassiusculis 0.8 m. alt., glabris, basi foliorum sterilius fasciculo stipatis; folia vagina multo longiora, plana, ad 9 mm lata, sensim acutata, acutissima (non subito acuminata et cucullato-contracta), margine et superne ad nervos vaginasque subcompressas scabrida; ligula ca 1.5 mm lg., lacera. Panicula demum effusa, laxa, ramis verticillorum 1—2, longis, demum patentibus, sub lente fortiore scabriusculis, a media parte spiculigeris; spiculae ca 6 mm lg., 3-florae; glumae glabrae, carinatae, inferior anguste lanceolata, univenia, 2.5 mm lg., superior paulo longior et latior, 3-venia, venis sat prominulis; flosculi glabri anguste-lanceolati; palea inferior elevatim 5-venia, explanata lanceolata, acuta, glabra, superior paulo brevior, glabra. Lana connectiva nulla. Antherae 3 mm lg.“. (D. Litwinow).

Spec. typ.: Caucasus: prov. Baku, distr. Kuba, inter frutices pr. Kusary 2300 m, 21 jun. 1899 fl. et defl. leg. Th. Alexeenko.

Affinis est *P. ibericae* Fisch. et Mey., sed differt panicula tempore floriendi laxa et spiculis tantum 6 mm longis.

38. *Poa Meyerl* Trin. in schedis (descripsit Roshev.). — *Poa angustifolia* f. *nigrescens* Roshev. ex parte. — Planta perennis 40—80 cm alta, rhizomate subrepente, stolonifero; caulis tenuis, glaber, teres, paucifolius, basi innovationibus numerosis circumdatus; folia anguste-linearia, ad 2 mm lata, vaginis carinatis, glabra, ± plana, innovationum fere setacea; ligula fere 1 mm longa. Panicula angusta, contracta, ad 9 cm longa, rami paniculae erecti, scabridi; spiculae 5—7 mm longae, 3—5-florae, virides vel ± violaceae; glumae lanceolatae, inaequales; palea inferior lanceolata, distincte-venosa, glaberrima, basi sine lanugine.

Spec. typ.: Caucasus: Talysch ad pagum Drysch in pratis subalpinis. VI 1930, leg. C. A. Meyer.

Differt a *Poa longifolia* Trin. rhizomate caespites non formante, stolonifero.

39. *Poa insignis* Litw. (mscr.). — „Rhizoma (ex specimine unico incompleto) videtur repens; culmus teres, 1.2 m alt., glaber, nodis e vaginis exsertis; folia linearia, plana, ad 5 mm lata, apice cucullato-constricta, margine scabra, vaginis breviora, inferiora parva (2.5 cm), culmea longiora (ad 15 cm); vaginae glabrae, fere ad medium fissae; ligula truncata, 1.5 mm lg., pilosa. Panicula viridis, ovato-oblonga, rachide scabriuscula, ramis in verticillis ad 5, scabridis, patentibus. Spiculae 4—4.5 mm lg., 1—2 florae; gluma inferior uninervis, ca 2.25 mm lg., lanceolata, acuta, margine membranacea, superior ad 3 mm lg., 3-nervia. Rachis spicularum scabrida. Palea inferior ca 4 mm lg., ovata, acuta, 5-venia, venis marginalibus cum medio validioribus, praeter carinam scabriusculam glabra. Palea superior 3.5 mm lg. Lodiculae binae, lanceolatae. Antherae 2.5 mm lg. Stigmata plumosa“. (D. Litwinow).

Spec. typ.: Asia media. Kasakstan, prov. Semipalatinsk in lariceto ad ripas lacus Marka-kul (A. Sedelnikow).

Appropinquat ad *P. sibiricum* Roshev., sed ligula pilosa et axi spicularum scabrido vel breviter hirsuto statim dignoscitur.

40. *Poa ussuriensis* Roshev. — *Poa acroleuca* auct. Fl. Asiae orient. non Steud. — Planta perennis, 35—80 cm alta, interdum caespites laxos formans, rhizomate fibroso; caulis adscendens, glaber, laevis, foliatus; folia linearia, plana, ad 5 mm lata, supra paulo scabrida; ligula elongata, 1—2 mm longa. Panicula elongata, subnutans 10—20 (—30) cm longa, non densa, rami paniculae scabridi ad 7 cm longi; spiculae ovato-lanceolatae, 3—5 mm longae, 3—5 (—6)-florae, viridulae, rariter paulo coloratae; glumae anguste-lanceolatae, superior inferiore latior et longior; palea inferior lanceolata-acuminata, distincte-nervata, glabra, veni dorsalis et laterales paulo pubescentes basi contortuplicato-lanata.

Spec. typ.: Asia orientalis, Prov. Austro-Ussuriensis, in valle fl. Suifun, affl. Suputinka et Volchva. In silvis. 5 VI 1913, leg. V. Komarov.

A *Poa trivialis* L. differt ligula multo brevior et spiculis multifloris.

41. *Poa stepposa* (Kryl.) Roshev. — *P. attenuata* var. *stepposa* Kryl. Fl. Sib. occid. II. (1928) 285. — Planta perennis, 25—50 cm alta, caespites densos formans, rhizomate fibroso; caulis $\pm$ erectus, glaber, parte superiore efoliata; folia anguste-linearia 0.5—1.25 mm lata, plana vel longitudine convoluta $\pm$ scabrida; vaginae glabrae, scabridae; ligula elongata, 2—3 mm longa. Panicula contracta, angusta, ad 10 cm longa, rami paniculae scabridi, ad 4 cm longi, paucispiculati; spiculae lanceolatae, 3—5 mm longae, 3—5-florae, virescentes, apice aureae, vel $\pm$ violaceae; glumae subaequales, lanceolatae. Palea inferior indistincte-nervata, glabra, veni dorsalis et laterales minute pubescentes palea basi sparse contortuplicato-lanata.

Spec. typ.: Altai, inter fl. Bortuldag et Kair in laricetis ad ripas fluvii. 25 VII 1903, leg. P. Krylov.

Differt a *Poa palustri* L. caulibus parte superiore efoliatis, sub panicula scabridis foliisque angustioribus $\pm$ convolutis.

42. *Poa rhomboidea* Roshev. — Planta perennis 40—45 cm alta, caespites parvos formans, rhizomate breviter repente; caulis glaber, laevis, foliatus; folia anguste-linearia, fere 1.5 mm lata, longe-acuminata, plana, glabra, subtus laevia, supra aspera; ligula fere 0.5 mm longa, truncata. Panicula paucispiculata, 5—8 cm longa, rami paniculae asperi, 1.5—2.5 cm longi, bini, 1—2 spiculati; spiculae fere 8 mm longae et 5—6 mm latae, $\pm$ rhomboideae, 7—8-florae, albo-variegatae; glumae paulo inaequales, anguste-lanceolatae; palea inferior lanceolata, obscure-nervata, glabra, veni dorsalis et laterales pubescentes, basi sine lanugine.

Spec. typ.: Caucasus occidentalis. Districtus Tschernomorsky ad fl. Psolouch (confluentem Msymtam) 3 VIII 1895, leg. W. Lipsky.

Differt a *Poa sterili* M.B. spiculis rhomboideis majoribus et multifloris.

43. *Poa pamirica* (Litw.) Roshev. — *Poa alpina* var. *pamirica* Litw. in schedis; — flanta perennis ad 15 cm alta, rhizomate repente, stolonifera; caulis $\pm$ adscendens, basi vaginis foliorum vetustis dense obsitus, non incrassatus, glaber, laevis. Folia plana, linearia, breviter acuminata, ad 4 mm lata, glabra, laevia; ligula lata, ad 4 mm longa. Panicula elongata, pyramidata non densa, rami paniculae patentes vel reflexae, laeves; spiculae fere 5—6 mm longae lanceolatae, 3—4-florae, variegatae vel $\pm$ lilacinae; glumae paulo inaequales superior inferiore latior et longior; palea inferior lanceolata, $\pm$ distincte nervata, glabra, veni dorsales et laterales dense pubescentes, palea basi contortuplicato-lanata.

Spec. typ.: Asia media. Pamir, in arenosis ad fl. Kisil-rabat (confl. Aksu) 4100 m 28 VII 1901, leg. Alexeenko.

Differt a *Poa alpina* L. caule basi non incrassato et palea inferiore angustiore basi contortuplicato-lanata.

44. *Poa calliopsis* Litw. (mscr.). — „Humilis. Rhizoma repens, stolones elongatos radicales emittens. Culmi 5—10 (15) cm alti, stricti, glabri, superne aphylli. Folia rigidiuscula, convoluta, subfiliformia, inferiora 2—4 cm lg., culmea breviora, omnia mucronulata, glabra v. sub acumine scabriuscula. Vaginae internodia tegentes glabrae. Ligula ad 3 mm lg., acuta. Panicula pyramidata parva (2—3 cm lg.), rara, ramulis scabriusculis divaricatis, solitariis, patulis, interdum deflexis, inferne nudis, sub apice spiculigeris. Spiculae 3.5—4 mm lg., pedicellis subaequilongis, ovatae, variegatae, 2—3 florum. Glumae subaequales, inferior paulo angustior, ca 2.5 mm lg., late ovatae, obtusae, 3-nerviae, glabrae v. superne ad nervum medium scabriusculae. Rachis spicularum glabra; lana copiosa; palea inferior ovata, v. subobovata, obtusa, 3—4 mm lg., superne hyalino-membranacea, ceterum colorata obscure 5-venia, inferne ad venas longe et crispule piloso-lanata, interstitiis inferne parce pilosis. Palea superior inferiori subaequilonga v. paulo brevior, ad costas scabrata. Lodicae binae membranaceae. Antherae ca 2 mm lg Stygmata 2 plumosa”. (D. Litwinow).

Spec. typ.: Asia media. Pamir in angustis ad fauces Chargosch N. versus in pratis. 26 VII 1901, № 3023/1451, leg. Th. Alexeenko.

Non dissimilis est *P. alpinae* L. sed stolonibus elongatis, foliis angustioribus panicula laxa et lana copiosa bene differt.

45. *Poa bedeliensis* Litw. (mscr.). — „Dense caespitosa; culmi recti, 0.15—0.25 m alti, glabri, ad medium foliati, basi foliis emortuis occultati et foliorum steriliu fasciculis stipati; folia rigidiuscula, plana, 1—2 mm lata, sensim attenuata, acuta; ligula ad 2 mm lg., ovata, lacera. Panicula depauperata, 3—5 cm lg., ramis 1—2, sub lente scabridis, inferioribus ad 2 cm lg., apice spiculigeris, spiculis breve (ca 5 mm) pedicellatis. Spiculae 5.5 mm lg., 2-florae, variegatocoloratae. Glumae subaequales, lanceolatae, acutae, ca 4 mm lg., inferior uninervia, superior paulo latior, 3-nervia. Flosculi lanceolatis acutis.

Rachis glabra. Palea inferior explanata ovata obtusiuscula ca 5 mm lg., sub apice hyalino marginata, 5-venia, venis lateralibus non prominulis, in parte dimidia inferiore ad venam mediam et marginales longe crispato molliter villosis, interstitiis parce pilosis. Palea superior 4 mm lg., ad costas ciliata. Filamenta 3 mm lg., antherae 1.5 mm. Lodiculae ca 1 mm lg. Caryopsis elongata compressa". (D. Litwinow).

Spec. typ.: Asia media. Kirgizstania, Semireczje, distr. Przewalsk, montes Thian-schan, ad trajectum Bedel, leg. D. Divnogorskaja.

Differt a *P. dshungarica* Roshev. statura minore, panícula paucispiculata et palea inferiore inter venas pubescente.

46. *Poa tremuloides* Litw. (mscr.). — „Rhizomate caespitoso, culmis 0.1—0.2 m alt., glabris, flaccidis, adscendentibus, basi fasciculis foliorum sterilium stipatis, superne nudis, vaginis glabris, nodis inclusis. Foliis flaccidiusculis, linearibus, planis, 1—1.5 mm lat., superioribus ad 5 cm lg. sensim acutatis, glabris; ligula protensa acuta, v. truncata, ca 2 mm lg. Panicula viridis interdum parce violaceo-tincta, angusta, 2—3 cm lg., ramis in verticillis 1—2 brevibus, scabriusculis, spiculas 1—2 gerentibus. Spiculae 4-florae. Rachis pilosiuscula. Glumae angusto-lanceolatae, acutae, ambae 3-nerviae, glabrae, ad carinam parce scabriusculae, inferior ca 3—3.5 mm lg., superior paulo longior et latior. Palea inferior ca 4 mm lg., acuta, 5-nervia, margine membranacea, dorso interdum violaceo tincta, ad nervum medium et laterales pilosula. Lana connectiva deest. Palea superior 3.5 mm lg., ad costas scabriuscula. Lodiculae binae lobatae. Antherae ca 1.2—1.5 mm lg., Stigmata plumosa.

In declivibus lapidosis in loco Kok-Dshar dicto 25 Aug. 1897 (S. Korshinsky) (D. Litwinow).

Spec. typ.: Asia media. Pamir, in rupestribus ad fl. Aksu (Murgab) pr. Ajukuzii-saj, 3,500 m 11 Jul. 1901 fl., leg. Th. Alexeenko.

A *P. laxa* Haenke cui affinis, caespitibus densis, spiculis majoribus et lana deficiente diversa est.

47. **EREMOPOA ROSHEV.** Gen. novum. — Panicula effusa vel contracta, rami paniculae longae, semiverticillatae. Spiculae ellipticae, (1)—2-multiflorae, rhachilla paulo geniculata, minute puberula. Glumae inaequales, inferior uninervata, superior trinervata. Palea inferior obscure carinata, nervi laterales non distincti, pars superior membranacea, acuminata vel breviter aristata, basi glabra sine lanugine. Stamina 3. Stigmata plumosa. Caryopsis paulo furcata, gluma fertilis paleae adherens.

Area geographica: Asia centralis.

Generis typus: *Eremopoa persica* (Trin.) Roshev.

Differt a genere *Poa* L. glumis sterilibus inaequalibus inferiore uninervata, superiore trinervata, palea inferiore obscure carinata acuminata vel breviter aristata, basi sine lanugine. Plantae semper annuae.

48. *Eremopoa oxyglumis* (Boiss.) Roshev.; *Poa persica* β *oxyglumis* Boiss. Fl. or. V (1884) 610. — Annua, culmus 15—50 cm altus, saepius, caules

plures, graciles, erecti, foliosi; folia anguste-lineararia, ad 3 mm lata, longe acuminata, plana vel $\pm$ convoluta, supra scabrida; ligula 2—3 mm longa. Panicula elongata, effusa, rami paniculae scabridi, per 3—7 (10) in nodis; spiculae ellipticae, 4—7 mm longae, 3—5-florae, virides vel $\pm$ violaceae. Glumae anguste-lanceolatae, inaequales. Palea inferior sensim attenuata acuta interdum brevisubulata.

Spec. typ.: Transcaucasia; Tzekhar, inter distr. Achalzich et Imeretia. 3 VII 1880 leg. M. N. Smirnow.

49. *Colpodium ornatum* Nevski. — Caespitosum, culmis 12—26 cm alt., basi bulboso incrassatis et vaginis emarcidis, pallide brunneis, integris vel leviter fissis obtectis laevibus, vaginis foliorum superiorum subinflatis, laevibus, foliis angustissime linearibus, convolutis, glabris laevibusque. Paniculae pyramidatae, ramis (2)3—4-nis, capillaribus, laevibus, erecto-patulis, (1—2)3—5-spiculatis, spiculis (2)3—6-floris, 0.45—0.7 cm lg., flosculis violaceis, superne flavido-argyreis, glumis minutis, 2 mm lg., ovatis, obtusiusculis subaequalibus, palea inferiore 3—3.5 mm lg., inferne violacea, superne argyreo-membranacea et p. m. flavido-colorata, apice eroso-truncata, elevatim trinervi, inferne ad nervos vix pubescenti vel fere glabra.

A *Colpodio humili* (M. B.) Griseb. spiculis multifloris et palea inferiore basi ad nervos vix pubescente vel fere glabra differt.

Spec. typ.: Asia media. Usbekistania. In jugo Kuhitang, in detritu non procul a cacumine in vicinis pag. Chodzha-fil-ata. 27 VI 1931. Leg. Nevski.

50. *Glyceria turcomanica* Kom. — Rhizoma repens, caulis a basi adscendens, dein rectus usque ad 1 m altus, 3 mm in diametro, aequaliter foliatus, basi stolonibus brevibus instructus; folia plana, tenuia, 5—8 mm lata, saturate viridia, subtus laevissima, supra scaberula, apicem versus sensim attenuata; ligula elongata, 5—8 mm lg., tenuissima, facile discrepans. Panicula circa 30 cm lg., ramulis fere capillaribus, infimis ternis, mediis binis, superioribus solitariis, omnibus reclinatis, interdum culmo fere adpressis, laevibus, longioribus quinque-spiculosis, caeteris spiculis 1—3 praeditis; spiculis longiter pedicellatis, 4—8-floribus, 15 mm longis, 2.5—3 mm latis cylindricis, paleis apice rotundatis, pallide viridibus, apicem versus argenteo marginatis, dorso 5—7 venosis.

Crescit ad ripas aquarum locis umbrosis.

Spec. typ.: Asia media. Turcomania meridionalis in jugi Kopet-dagh angustiis Aj-dere nec non Mustafa-dere prope Nuchur, 1100 n supra mare. 27 VI 1925, leg. E. G. Bobrov.

Affinis *G. plicatae* Fries, nec non *G. nemorali* Uechtr. et Körn. a primo autem spiculis valde remotis minoribus minus numerosis, paniculae ramis arcte in statu maturo reclinatis; a secunda venis glumellae aequilongis differt.

51. *Glyceria triflora* (Korsh.) Kom. — *G. aquatica* var. *triflora* Korsh. in A. H. P. XII (1892) 418 — Rhizoma elongatum radicans, caules erecti 0.9—1.4 m lg. satis firmi; folia fere laevia, plus quam 1 cm lata, venis medianis progressis, ligula usque 3 mm lg. Panicula ampla 20—30 cm lg., satis densa, ramulis scabris numerosis, infimis fere semper solitariis, spiculis oblongis 5—8 mm lg., 3—5-floris, pallide viridibus, serius autem rubescentibus vel etiam atroviolaceis; glumis 2—3 mm lg. obtusis vel acutiusculis; paleis oblongis, venis septem prominulis, apice obtusis crenatis vel emarginatis.

Crescit in stagnis secus Amur fluvium.

Spec. typ.: Asia orientalis. inter fl. Zeja et Bureja, prope p. Ivanovskaja. 24 VII 1891 leg. S. I. Korshinsky.

Affinis *G. aquaticae* (L.) Wahlb., differt autem panicula diffusa spiculis parvis distantibus, floribus in spicula minus numerosis, paleis saepe apice emarginatis, caulibus foliisque debilioribus.

52. *Glyceria kamschatka* Kom. — Rhizoma breve stoloniferum, caulis erectus 0.8—1.2 m elatus, 5—8 mm crassus, folia laevia, angusta, 8—10 mm lata apicem versus sensim angustata acuta, ligula circa 5 mm lg., subcylindrica, quam folium angustior, interdum violascens. Panicula ampla satis diffusa ramulis gracilibus, infimis 1—3, spiculae usque septemflorae 8—10 mm lg., glumae ovato-lanceolatae albiae vel pallidae, paleae oblongae, apice obtuse rotundatae atro-violaceae concolores vel anguste pallide marginatae, antherae aurantiacae circa 1 mm lg.

Crescit in stagnis, ad ripas lacuum et in paludibus aquosis in valle fluvii Kamschatka in parte centrali peninsulae Kamschatka.

Spec. typ.: V. Komarov 20 julio 1909 prope pagum Maschura; Protopopov I. G. 29 VIII 1909 prope p. Uschki.

Affinis *G. aquaticae* Wahlenbg. differt autem panicula diffusa, glumis multo acutioribus, paleis minoribus, caule multo graciliore, foliis duplo angustioribus.

Nota: *G. aquatica* var. *debilior* Trin. sub *G. debilior* Kudo a beato prof. Y. Kudo (Flora of the Island of Paramuschir in Journ. of the College of Agriculture, Hokkaido Imp. University XI, 1922, 74) non huc, sed ad *G. orientalem* Kom. potius reportata.

53. *Glyceria ussuriensis* Kom. sp. nova. — Rhizoma breve ramosum, caespites parvos efformans; caules erecti firmi usque metrales 6—7 mm crassi; folia 6—12 mm lata acuta scaberula ecarinata, vaginis internodia fere occultantibus; ligula rotundata brevis, c. 2 mm lg. Panicula densa ampla 15—25 cm lg., 4—12 cm lata, saepe subsecunda, ramulis erectis scaberulis, infimis ternis; spiculae 5—7-flores, 5—8 mm lg. pallidae, glumae albiae laeves; paleae albomarginatae apicem versus attenuatae acutiusculae, venis 5 plus minusve prominulis; antherae luteae.

Spec. typ.: Regio Ussuriensis. pagum Kondratenkova in valle fl. Suputinka. 27 VIII 1933, leg. V. L. Komarov.

Affinis *G. aquatica*, differt autem panicula subsecunda pallida apice nutante ramulis gracilioribus, spiculis paullo angustioribus nec non longioribus, glumellarum apicibus hyalinis, venis multo minus scaberulis: folia angustiora apicem versus sensim et longius angustata.

54. *Atropis geniculata* (Turcz.) V. Krecz. — *Poa geniculata* Turcz. in sched. — *Poa nutkaensis* Trin. in Mém. Ac. Sc. St. Pétersb., sér. 6, II Suppl. (1838) 69, pp. — *Atropis angustata* Griseb. in Ldb. Fl. Ross. IV (1853) 390, quoad pl. ochotensem. — *Puccinellia geniculata* (Turcz.) V. Krecz. — Ab *A. phragmоди* (Trin.) V. Krecz. statu haud stolonifero, panicula multispiculata et glumellis apice sensim angustatis (nec trigonis) differt, atque a *P. nutkaensi* (Presl) Fern. et Weath. (cujus specimina Presliana tautotypica in herb. Trinii vidi) caespitibus laxis (nec perdensis), ramis paniculae laevibus, paleis glabris et antheris 1.8—2 mm (nec 1—1.2 mm) longis diversa est. — Littora maris Ochotensis ditionibus Ochotsk et Ajan.

Spec. typ.: In glareosis maritimis Ochotiae legit Kusnetzov, 1835, ex herb. Turcz.

55. *Atropis macranthera* V. Krecz. — *Puccinellia macranthera* V. Krecz. Planta rigida, cinerea, 30—50 cm alt., alte et perlaxe vaginis scabriusculis vestita, foliis planis vel subconvolutis, ca 4—5 mm latis. Panicula ovatopyramidalis, 10—20 cm lg., rachi ramulisque scaberrimis, ramis deinde patentibus, spiculis oblongoellipticis, 5—6 mm lg., 4—6-floris, laxulis, variegatis, rachi laevi; glumis ovatis, obtusatis, super. — 2 mm, infer. — 1—1.5 mm lg.; palea infer. obconico-obovata, 2.3—3 mm lg., apice obtuse trigona, margine ciliolata, basi venulis pilosulis, violaceo-aureo limbata; palea super. aequilonga, carinis ciliatis, basi pilosula; antheris incrassatis, 1.6—2 mm longis.

In salsis Sibiriae Angaro-Sajanensis, Dahuriae et Jakutiae nec non Mongoliae borealis collimitaneae.

Spec. typ.: Prov. Jenisseisk, regio Minussinsk, in vicinis lacum Schiro, ad lac. Utitchje, № 467, 22 VII 1910, V. I. Smirnov.

A *P. geniculata* m. et *P. maritima* Parl. imprimis rhizomate haud stolonifero, ramis scabris, glumis paleisque inferioribus marginibus ciliolatis et oecologia distinguitur.

56. *Atropis humilis* Litw. mss. (inedit.) — *Atropis convoluta* var. *acutiuscula* Hack. in A.H.P. XXI (1903) 442. — *Puccinellia humilis* Litw. Planta humilis, 5—15 cm alt., dense caespitosa, foliis convolutis glabris. Panicula oblonga, coarctata, lobata, 2—4 cm lg., rachi et ramis laevibus; spiculis ad ramulos 1—2, ellipticis, 6—7 mm lg., 5—6-floris, violaceis, glumis obtusatis, sup. — 2.5—3 mm, infer. — 2.2—3 mm lg.; paleis infer. ovatis, 3.5—4 mm lg., basi pilosulis, violaceis, margine hyalinis; paleis superioribus brevioribus, supra ad carinas setulosulis; antheris 1—1.1 mm lg.

In alpinis (alt. 3—3500 m s. m.) jugorum Alaici et Transalaici Asiae Mediae.

Spec. typ.: in argillosis trajectus Taldyk m. Alajicorum, № 5282, 11 VII 1895, leg. D. S. Korshinsky.

A *P. kurilensi* Honda habitu humiliore rigidioresque caespitibus perdensis, foliis convolutis, panicula spiciformis cum ramulis coarctatis differt.

57. ***Atropis pamirica*** (Roshev.) V. Krecz. — *Atropis tenuiflora* Hack. in A. H. P. XXI (1903) 442 ex p. — *Atropis distans* f. *pamirica* Roshev. in A. H. P. XXXVIII (1924) 121. — *Puccinellia pamirica* V. Krecz. — Planta caesia vel violaceo viridis, nitens, 20—40 cm alt., basi vaginus brunnescentibus subnitentibus dense vestita, foliis convolutis glabris. Panicula post anthesin constricta, 7—10 cm lg., ramis laevibus, infer. — ad 3—4 cm lg., spiculis acutis, ovatis, 3—4-floris, ad 5 mm lg., angustatis; glumis obtusatis, super. — 2—2.5 mm, infer. — 1.5—1.8 mm lg.; paleis infer. rhomboideo-lanceolatis, 3—4 mm lg., violaceis, margine hyalinis; paleis super. surpa ad carinas sparse setulosi, glumella brevioribus; antheris violaceis, 1.8—2 mm lg.

In locis salsugineis humidis et ripariis in alt. 3500—4000 m. s. m. mont. Pamir et Tugdunbasch-Pamir.

Spec. typ.: Pamir, lacus Kara-Kul, Suok-tchubyr, 5 VIII 1878, leg. I. I. Skorniakov.

A *P. distanti* Parl. panicula constricta glumellis longioribus, angustate acutis, carinatis et antheris violaceis duplo longioribus differt.

58. ***Atropis subapicata*** V. Krecz. — *Puccinellia subspicata* V. Krecz. — Planta pallide vel cinerascens-viridis, mollis, 3—15 cm alt., foliis subplanis, mollibus. Panicula oblonga, 1—5 cm lg., spiciformis, ramis paucis, abbreviatis (inferior. — 1—2 cm lg.) et laevibus, spiculos 1—2 portantibus; spiculis oblongis, 3—7-floris, laxulis, subdissitifloris, 0.8—1 cm lg.; glumis obtusatis, super. — 2—2.5 mm, infer. — 1—1.5 mm lg.; paleis infer. ellipticis vel ovatis, 4—5 mm lg., supra subito angustatis, basi viridibus, superne violaceis, marginibus hyalinis, paleis super. brevioribus, supra ad carinas parce setulosi; antheris obscure coloratis, 2 mm lg.

In pratis alpinis nano-herbosis montium Tian-Schan et Pamiro-Alaji (alpes Hissaricae, Serawschanicae et Darvasicae) ad 3000—3500 m. s. m.

Spec. typ.: Buchar, in decliv. merid. jugi Hissar: Subaschi, 10.000 ped., 3 VII 1896, № 4623, V. Lipsky.

A praecedente differt habitu humiliore, foliis et omnibus partibus viridioribus mollioribusque ramis paniculae 1—2 cm longis, spiculas paucas (1—2 nec 4—6) gerentibus, spiculis laxioribus et longioribus, paleis infer. ad 4—5 mm longis.

59. ***Atropis pauciramea*** (Hack.) V. Krecz. — *Atropis distans* f. *pauciramea* Hack. in A. H. P. (1913) 442. — *Puccinellia angustata* var. *glabrata* Litw. inedit. — *Puccinellia pauciramea* (Hack.) V. Krecz. Panicula semper divaricata, 4—6 cm longa, ramis incrassatis laevibus vel scabriusculis spiculis paucis, pedicello incrassato, 3—4-floris, 5—6 mm lg., atro violaceis, glumis obtusatis, super. — ciliolatis, 1.8—2 mm lg., infer. — 1.2—1.5 mm lg., paleis infer. late obovatis,

superne obtusato-trigonis, (2.5) 3—3.2 mm longis apice subrotundato trigonis, ciliolatis, violaceis, aureo-limbatis paleis super. ad carinas laevibus; antheris oblongo-ellipticis, flavidis, 1.5—1.8 mm longis. Planta cinerascens vel caesio-viridis, foliis convolutis.

In schistosis, glareosis et arenosis salsugineis alpinis (alt. 3000—3500 m. s. m.) Pamiro-Alajicis et partis occidentalis. m Tian-Schan.

Spec. typ.: Pamir, inter Khodsha-Nazar et traject. Koi-tezek, 4000—5000 m, № 36, 20 VII 1901, leg. B. Fedtschenko.

A praecedente panicula divaricata, paleis infer. late obovatis, superne obtusato trigonis, paleis super. laevibus et antheris oblongo-ellipticis brevioribus differt.

60. **Atropis Grossheimiana** V. Krecz. — *Pucc. sevangensis* Grossh. Fl. cauc. 1 (1928) 114, ex min. parte. — *Puccinellia Grossheimiana* V. Krecz. Planta cinerascens, rigidula, 30—60 cm alt., foliis setiformi-convolutis, scabris. Panicula 5—15 cm lg., ramis ramulisque divaricatis, subflexuosis, laevibus; spiculis lanceolatis, 3—4-floris, densis, 4—5 mm lg.; glumis acutis, ciliolatis, super. — 2—2.5 mm, carinatis, infer. — 1.2—1.5 mm lg.; paleis infer. 3—3.5 mm lg., atro-violaceis, aureolimbatis; paleis super. superne dense et minute setulosis; antheris oblongis, 1.6—2 mm lg.

Ad ripas fluminum lacuumque Armeniae rossicae.

Spec. typ.: Armeniae distr. Nor-Bajazet: prope p. Mazra Minor, 2 VII 1928, leg. O. Sedelmeyer et T. Heidemann.

A praecedentibus paleis infer. oblongo-ovatis, apice late acutis, paleis super. superne ad carinas setulosis et glumis acutis differt. *Pucc. sevangensis* Grossh., quacum specie nostra hybridas format, differt paniculis magnis, longe ramosis, ramis scaberrimis, paleis infer. viridibus, 2—2.3 mm longis, apice rotundato obtusis, antheris vix 0.5 mm longis.

61. **Atropis pulvinata** (Fr.) V. Krecz. — *Glyceria distans* **pulvinata* Fr. Mant. II (1839) 11. — *P. retroflexa* var. *pulvinata* Holmb. ex Lindem. Sv. Fan. Fl. (1918) 97. — *Puccinellia pulvinata* (Fr.) V. Krecz. — Exs.: Pl. Finl. exc. 484. — A *P. suecica* Holmb. coloratione caesia, basi rosaceo, statu dense caespitoso, pulvinato, caulibus exterioribus accumbentibus, 10—30 cm alt., inter. — rectis, 3—10 cm alt., foliis magis convolutis, glumis acutioribus, paleis infer. brevioribus (2—2.5 nec 3—3.5 mm lg.), margine ciliolatis (nec glabris), basi glabris (nec pilosis), antheris flavescentibus (nec fulvis vel violaceis), 0.5—0.6 mm (nec 0.8—0.9 mm) lg. distinguitur.

In syrtibus maritimis (subnatante) marium Barentsii et Albis.

Spec. typ.: Fr. Herb. norm. V. 90; Hall. bor. Varberg, VII. leg. E. Fries.

62. **Atropis choresmica** V. Krecz. — *Puccinellia choresmica* V. Krecz. — A *P. kamtschatica* Holmb. differt coloratione caesio, statu caespitoso, caulibus radiantibus, 10—20 cm alt., paleis aequilongis et a *a. pulvinata* m. glumis et paleis inf. obtusis, basi pilosulis et caulibus constrictis erectisque. Panicula coarctata, deinde diffusa et reclinata, ad 10 cm lg., spiculis 5—8-floris, oblongo-

ellipticis, 5—7 mm lg.; glumis super. — 2—2.5, infer. — 1.5—1.8 mm lg.; paleis infer. obovatis, subcarinatis, 2—2.5 mm lg., apice subtrigono-obtusatis, ciliatis; antheris 0.6—0.8 mm lg., sulfureis.

In arenosis salsugineis partis inferioris fl. Oxus et in canalibus reg. Karakalpakiae (Choresm vel Corasmiorum reg. auct. antiqu.).

Spec. typ.: Karakalpakia, in ostia fl. Oxus: in silvulis septentrionem versus a mont. Kran-tau, n° 60, 16 IV 1915, leg. H. M. Krascheninnikov.

63. **Atropis laeviuscula** V. Krecz. — *Glyceria tenella* Ostenf., Fl. arct. I (1902) 129, ex p. — *Puccinellia laeviusculu* V. Krecz. — Ab *A. tenella* (Lg.) m. differt caulibus apice subsulcatis basi laevigatis, nitentibus, $\pm$ fistulosis, ramis inflorescentiae valde distantibus, tardius reclinatis (nec vix erecto patulis), glumis paleis infer. costato nervosis, paleis infer. apice subtrilobato apiculatis, basi glabris (nec pilosiusculis), paleis super. ad carinas autem glabris (nec ciliatis). Culmi 15—20 cm lg.; panicula 8—10 cm lg., spiculis 3—4.5 mm lg., 3—4-floris, glumis super. ca 2 mm, infer. — 1.3—1.5 mm lg., paleis infer. oblongo-ovatis, 2—2.5 mm, antheris 0.5—0.7 mm lg.

In regione Behringensi occurit.

Spec. typ.: In sinu Sancti-Laurentii, VIII 1903 (fr.), leg. N. Sokolnikov.

64. **Atropis glauca** (Rgl.) V. Krecz. — *Atropis distans* β *glauca* Rgl. in A. H. P. VII: 2 (1881) 623. — *Puccinellia glauca* (Rgl.) V. Krecz. — A *P. distant* Parl. coloratione cinereo (nec virenti), ramis elongatis, diffusis (nec abbreviatis, erecto patulis), spiculis laxioribus, 5—6 mm lg. (nec 4—5), paleis infer. obovatis (nec dilatato obovatis), apice rotundatis (nec plano abruptis), viridibus (nec violascentibus aureolimbatis), nervulis obsoletis, antheris flavidis vel violascentibus (nec pallide-aurantiacis), 0.8 mm lg. differt.

Ad canales, rivulos, agros inundatos Asiae Mediae.

Spec. typ.: in vicinis urbis Katta-Kurgan ad canalem Narunai, 1366 ped. alt., 29 V 1869, O. Fedtschenko.

65. **Atropis Hackeliana** V. Krecz. — *Atropis convoluta* var. *subscariosa* Hack. in Kjev. Vidensk. Meddel. (1903) 172. — *A. tenuiflora* Hack. in A. H. P. XXI (1906) 443, non Griseb. — *A. convoluta* Hack. l. c. 442, non Kuth. — *Colpodium filifolium* Hack. ex Fedtsch. in A. H. P. XXXVIII (1924) 119. — *Puccinellia Hackeliana* V. Krecz. — Exs.: Herb. Kronenb. 41. — A praecedente et *P. distant* Parl. differt coloratione caesio-viridi, foliis abbreviatis, convolutis, laevibus, spiculis violaceis, apice subtrigono-rotundatis, marginibus late albo-hyalinis, ciliolatis, basi pilosulis, paleis super. superne ad carinas ciliolatis, basi ciliolato-pilosis. Culmi 10—35 cm alt.; panicula 5—10 cm lg.; spiculae 3—5-florae, 4—5 mm lg., glumae 2—2.3 mm et 1.5—2 mm lg.; paleae infer. (2) 2.5—3 mm lg., paleae super. vix breviores; antherae 0.8—1 mm lg.

In stepposis excelsioribus, decliviis et glareosis montium Pamiro-Alajicorum et Thian-Schan adjacentium.

Spec. typ.: Pamir, ad lacum Sassyk-kul, № 21, 17 VIII 1901, leg. B. Fedtschenko (sub nom. *Atr. tenuiflora* Hack. determ.).

66. **Atropis Hauptiana** (Trin.) V. Krecz. — *Poa Hauptiana* Trin. — mediet. *Atropis distans* auct. fl. Sibir. — *A. distans* var. *multiflora* Turcz. in herb. — *Puccinellia Hauptiana* (Trin.) V. Krecz. Plantae tenuis, pallidae, submolles, 15—60 cm altae, foliis planis, 1—2 mm latis. Panicula constricta, tardius diffusa, 15—20 cm lg., ramis elongatis, capillaceis, scabris, basi ramulis abbreviatis haud instructis, spiculis elongatis, (5) 6—8 floris, 4—5 mm lg.; glumis ovatis, 1.2—1.5 mm et 0.7—1 mm lg.; paleis infer. obovatis, late rotundato-obtusis, 1.7—1.8 mm lg., margine ciliolatis, subincisis, viridibus, superne pallidioribus, nervis obsoletis, basi $\pm$ pilosiusculis; paleis superioribus paleas inferiores ca 1.5—2 mm superantibus, ad carinas breviter ciliolatis, antheris anguste ellipticis, 0.5—0.6 mm lg.

In paludosis et in pratis humidis Sibiriae totius usque ad littora Oceani Pacifici atque occidente usque ad Volgam inferiorem, meridie ad deserta Asiae Mediae nec non in Mongolia, Mandshuria et China boreali occurrit; etiam in statu ruderali in Leninopoli (circa Academiam!). — Vidi in herb. Leninopolitano specim. Trinii cum schedula: „*P. Hauptiana* m. (*maritima* affin.), in distr. Kurganico, in pratis locis arenosis siccis“.

A praecedentibus imprimis paleis super. paleas infer. evidenter superantibus antheris brevioribus differt.

67. **Atropis iliensis** V. Krecz. — *Puccinellia iliensis* V. Krecz. — A praecedente differt dimensione minore (5—20 cm alt.), habitu compactiore, caulibus numerosissimis radiaantibus, usque ad paniculam vaginis vestitis, foliis abbreviatis, subconvolutis panicula oblonga duplo brevior in fasciculo 3—4-rameo duo abbreviata, spiculis 3—5-floris, 2—3 mm lg.; glumis rotundato-obtusis, super. — late ovatis, subplicatis, ca 1 mm lg. infer. — ovatis, ca 0.5 mm lg.; paleis infer. late obovatis, 1.5—1.6 mm lg, apice rotundatis, dense ciliolatis, basi glabris; antheris 0.4 mm longis.

In pratis solo arenoso ditionis fl. Ili Heptapotamiae et regionis chinensis Kuldscha.

Spec. typ.: Kasakstania. Distr. Kopal, ad initionem locis Bakanas secus flum. Ili. № 125; 5 V 1913, leg. B. Schischkin et V. Genina (fl.) et in loco Arkalyk prope lacum Arkar, in arena solida, № 641, 4 V 1908, leg. Th. Sokolov. (fr. caduc.)

68. **Atropis sevangensis** V. Krecz. — *Puccinellia sevangensis* V. Krecz. Grossh. in Fl. Cauc. I (1928) 114. — Pl. magna, recticulmis, fere haud caespitosa, 60—80 cm alt., foliis subplanis, 3—3.5 mm lat. Panicula flabelliformis, 2—30 (40) cm lg., ramis valde prolixis, tardius diffusa; spiculis in extremitate ramulorum, 2—5-floris, laxulis, 4—5 mm lg., viridibus, demum violascentibus; glumis ovatis, 1.5—1.8 mm et ca 1 mm lg.; paleis infer. late obovatis, 2—2.3 mm lg., rotundato-obtusis, aureo-limbatis, margine ciliolatis, basi glabris; antheris abbreviatis, dilatatis.

In locis humidis Armeniae Sovieticae (ubi cum *A. Grossheimiana* V. Krecz. hybridas format).

Locus classicus: insula Sevang lacus Sevang vel Goktcha, typus in herb. Horti Tiflisiensis, tautotypus in herb. Instit. Bot. Leninopolitani.

A praecedentibus glumis paleisque aequilongis, antheris dilatato-linearibus, glumis marginibus eciliolatis et panicula flabelliformi magna differt.

69. **Atropis chilochloa** V. Krecz. — *Puccinellia chilochloa* V. Krecz. — *A. P. gigantea* Grossh. coloratione caesio-viridi, panicula majore et densiore et vegetatione denso magnoque caespitoso differt aut foliis abbreviatis, apice subabrupte cucullatis, paleis infer. 2.5—3 mm longis.

In aqua et ad ripas lacuum fluviorumque regionis desertorum Aralo-Caspium.

Spec. typ.: prope Bidai-kul inter urbem Kzyl-Orda (Perowsk olim) et locum Kara-Uziak, 12 V 1914, leg. H. Krascheninnikov.

70. **Atropis anisoclada** V. Krecz. — *Atropis distans* f. *robusta* Roshev. in A. H. P. XXXVIII (1924) 121. — *Puccinellia anisoclada* V. Krecz. — Caules 50—100 cm alt., foliis subconvolutis vel subplanis, supra scabris. Panicula ramulis inaequalibus, 1—2 elongatis, caeteris abbreviatis, ad basin praecedentium fasciculatim congestis, tenuibus, scabris; spiculae lineares, 4—8-florae, densae, 5—8 mm lg., floribus ovatis obtusis, ciliolatis, 2—2.5 et ca 1.5 mm lg., paleis infer. late obovatis, 2—2.5 mm lg., paleam super. late circumvelatis, apice subtrigono rotundatis, ciliolatis, viridibus, superne late violascenti fuscatis, basi $\pm$ pilosiusculis, paleis angustioribus et laeviter brevioribus, superne ciliolatis; antheris ca 1.5 mm lg.

In depressis salsuginosis montanis et in agris Asiae Mediae frequens.

Spec. typ.: jugum Kugitang, in loco salso inter colles prope pag. Lalemkán, 24 VI 1921, № 387, leg. S. Nevski.

A praecedentibus dimensione, habitu, spiculis valde imbricatis et paleis infer. forma differt.

71. **Atropis dolicholepis** V. Krecz. — *Atropis convoluta* auct. fl. ross. pro max. parte. — *Puccinellia dolicholepis* V. Krecz. — Caules 30—60 cm alt., basi vaginis castaneo-brunneis vestiti, foliis setiforme convolutis, laevibus (revolutis ca 1.2—1.5 mm lat.). Panicula pauxilla, 10—15 cm lg., partibus scabris; spiculae lineares vel lineari-lanceolatae, 3—4-flores, 5—7 mm lg., violascentes, glumis oblongo-ovatis, super. $\pm$ acutis, 2—2.5 mm lg., infer. — acutiusculis, 1—1.3 mm lg., paleis infer. oblongo-ovatis, 3—3.5 (4) mm lg., apice subacute attenuatis, vena media carinatim prominula, venis caeteris — conspicuis, purpureo-violaceis, basi pilosulis, paleis super. vix brevioribus, ad carinas superne scabris, basi pilosulis, antheris oblongis, 2 mm lg., aurantiaco-luteis.

In steppis artemisiaco-festucaceis et desertis artemisiaceis solo salso Ucrainiae, Volgae inferioris, Caucasi borealis et orientalis, Baschkiriae et Kasakstaniae vulgariter.

A praecedentibus foliis convolutis, paleis infer. longioribus apice subacuto attenuatis imprimis differt.

NB. Specimina pauca ex Ucraina, quae ab *A. dolichotepidi* m. differunt spiculis glumis et paleis infer. minoribus: glumis 1.8—2 mm et 1.2—1.3 mm lg., paleis infer. 2—2.5 mm lg., apice trigonis, carinatis, paleis super. basi glabris antheris 1—1.3 mm lg., temporaliter sub nomine *A. convoluta* (Kth.) Griseb. conservo.

72. *Atropis sclerodes* V. Krecz. — *Atropis distans* var. *crassifolia* Roshev. in A. H. P. XXXVIII (1924) 121. — *Puccinellia sclerodes* V. Krecz. — A praecedente crassitudine et duritie majore, caulibus ca 2—2.3 mm crassis (nec ca 1—1.2 mm), basi vaginis perlaxis et dilatatis brunnescentibus alte et libere vestitis, foliis rigidioribus, ± convolutis (revolutis ca 3—3.5 mm lat.), subito acuminatis, panicula compactiore, demum subdivaricata, spiculis linearibus, cylindraceis, nitentibus, 4—7-floris, 5—7 mm lg., vulgo geminatim dispositis, brunnescentibus; paleis infer. 2—2.5 mm, cylindraceo-convolutis, paleam super. breviorum amplectentibus, apice obtuse trigonis, subcarinatis, basi pilosulis, ferrugineo-violaceis, antheris 1.5—1.6 mm longis differt.

In salsis regionis stepposo-desertis et desertis tanaitico-volgensis, aralo-caspicis, transoxanis et heptapotamicis nec non ferganensis.

Spec. typ.: in districtu Akmolinsk in valle fl. Sary-su, loco Tagusken, 21 VII 1908, leg. V. Smirnov.

73. *Atropis macropus* V. Kresz. — *Puccinellia macropus* V. Kresz. — Planta multicaulis, culmis basi vaginis vetustis subnitentibus et fibroso-membranaceis alte et dense vestitis, caespites magnos perdensos formans; a praecedente etiam differe foliis strictis, panicula constricta, ramulis brevibus, alternatim spiculosis, spiculis lineari-lanceolatis, 2—3-floris, stramineis, 2—5 mm lg.; glumis lanceolatis, acutiusculis, 2 mm et 1 mm lg., paleis infer. 2—2.5 mm lg., apice trigono acutiusculis, marginibus late albo-hyalinis, basi glabris, paleis super. usque ad basin scabris, antheris sulfureo-luteis, 1.2—1.5 mm lg.

In arenis salsuginosis Songoriae (pars orientalis lacus Balkhasch).

Spec. typ.: Heptapotamia, distr. Taldy-Kurgan in parte inferiore fl. Karatal: Takyr-Isgar, in locis salsis arenosis, n° n° 291 et 292. 20. VII. 1928, leg. Baz. I. Smirnov.

74. *Atropis tenuissima* Litw. inedit. — *Atropis tenuiflora* Korsh. in Mém. Ac. St. Pétersb., sér. VIII, VII (1898) 46, non Griseb. — *A. convoluta* auct. ex p. — *Puccinellia tenuissima* Litw. — *Pucc. Korshinskyana* V. Krecz. in sched. — A praecedentibus differt gracilitate omnium partium atque characteribus sequentibus: planta caespites parvos formans, culmis vix 0.5 mm crassis, 20—50 cm alt., foliis filiformi-convolutis, panicula depauperata pauciflora constricta, tardius vix oblique erecta, ramulis laevibus vel sublaevibus, spiculis ellipticis, 3—5-floris, 3—4 mm lg., glumis obtusis, eciliatis, 1.5—1.7 mm et 0.7—1 mm lg., paleis infer. oblongo-ovatis, ecarinatis, 2 mm lg., rotundato-obtusis, violaceis, ciliolatis, ad basin cum venulis obsoletis pilosulis, antheris linearibus, 1.2—1.5 cm. lg.

In locis subsalsis ripariis et stepposis (solo subatricolori) regionis stepparum stipacearum et stipaceo-vario-hebrosarum uralensi-volgensium, kasakstanicarum et altaicarum.

Spec. typ.: in steppis prope lacum Khudaikul territ. Pavlodar reg. Semipalatinsk Kasakstaniae, № 229, 24 VI 1889, leg. V. Resnitchenko; ib., is salsis ad lacum Tschuruk-sor, 15 VI 1899, № 144, id.

75. **Atropis diffusa** V. Krecz. — *Puccinellia diffusa* V. Krecz. — A praecedente caulibus basi incrassatis, vaginis vetustis dense vestitis, foliis subrevolutis; 0.8—1.3 mm latis, panicula diffusa, 10—20 (nec 5—12) cm lg., ramulis elongatis, extremitate vix scabriusculis, spiculis subsolitarios, lineari-lanceolatos, 4—8-flo-ros, 5—6 mm lg., argenteo-violaceos gerentibus, glumis rotundato-obtusis, 2 mm et 1.2 mm lg., paleis infer. obovatis, 2—2.3 (2.5) mm lg., apice rotundatis vel late obtusato-trigonis, ciliolatis, basi pilosulis, marginibus stramineis, paleis super. superne ad carinas scabris, basi pilosulis, antheris ca 1.5 mm lg.

In pratis stepposis regionis Tschu-iliensis et Jaxarticae Asiae Mediae.

Spec. typ.: regio iliensis inferior: loco Ak-Tugai prope fl. Ili, 5 VI 1921, leg. S. A. Nikitin.

76. **LOLIOLUM** V. Krecz. et Bobr. gen. novum. — Syn: *Nardurus* Boiss., pro min. parte, non Rchb. — Herbae annuae, spiculis in spicam simplicem densam unilateralem complanatam dispositis. Spiculae sessilibus, in excavationibus rachis solitariae alternaeque, una facie axin obiectae (altera spectantes), haud pauciflorae, flosculis subdivergentibus, dense congestis. Glumae binae, spiculas condensatas superantes, subaequales, subulatae, acutae, ad basin marginibus membranaceae, venis solitariis, valde incrassatis percursae. Palea inferior ovata, concava, crassiuscula, apice subabrupta et arista abbreviata instructa, venis 5 obsoletis percursa. Palea inferior obsolete bidentata, bicarinata, carinis usque ad basin setulosa. Stamina tria, antheris ellipticis; styli bini, breves, stigmatibus plumosis. Caryopsis oblonga, ventre longitudinaliter concava.

Genus a *Narduro* Rchb. specie densioribus, spiculis subsessilibus (nec pedicellatis) aut densioribus, semper unilateraliter dispositis, glumis subaequalibus spiculas superantibus, superioribus — univeniis (nec triveniis), paleis inferioribus ovatis (nec lanceolatis), breve aristatis; atque a generibus *Catapodio* Link et *Micropyro* Link spicularum dispositione, glumis acutis univeniis, paleis inferioribus ecarinatis aristulatis distinctum.

Tamen *Vulpia* Gmel. a genere nostro inflorescentia ramosa, dispositioneque spicularum atque glumis et paleis infer. forma, anthera unica facile distinguitur.

Generis typus: *Lolium orientale* (Boiss.) V. Krecz. et Bobr. (Exsiccata: P. Sintenis, Iter Transcasp.-pers., 1900—1901, № 1586, sub *Narduro orientali*).

Genus in Asia syriaco-armeno-persica et media (turkestanica) occurrit.

77. **Festuca cryophila** V. Krecz. et Bobr. *F. rubra* var. (vel f.) *arenaria* Holmb., Lyngbe et alii auct. fl. Fennoscand., non Fr.; Drobov in Trav. Mus. Bot. Ac. St. Pétersb. XIV (1915) 167. — *F. rubra* var. *arenaria* f. *arctica* Hack., Mon. Fest. (1882) 140.

Planta viridis, stolonibus brevibus, caespites laxos formans, culmis 10—50 cm altis, geniculato ascendentibus, basi vaginis rubris vel brunneis

vestitis; foliis abbreviatis (2—3 cm lg.), inferne demotis, subconvolutis, subito acutatis, subobtusis, laevibus. Panicula brevis, spiciformi-conferta, 2—5 cm lg., spiculis paucis vel haud numerosis, axi ramulisque scabra, spiculis ovatis vel ellipticis, 5—8 (10) mm lg., 3—5 mm lat., variegatis, brunnescenti-viridibus, axi sparse pilosiusculis; glumae acutiusculae vel saepius obtusiusculae, subglabrae, nitentes, venis elevatis, marginibus hyalinis, minute ciliolatis, brunnescenti-purpureae, superior—late lanceolata, saepius subovata, 3—3.5 (4) mm lg., triveniis, inferior—2—2.5 (3) mm lg.; palea inferior late lanceolata, fere ovata, 4.5—5 (6) mm lg., breviter aristulata, dense crispato pilosula, purpurascanti-viridis; palea inferior ad carinas breviter setuloso-ciliolata. Antherae flavae vel violaceae, 2—2.5 mm lg.

In locis argillosis tundrarum littoris oceani glacialis a Scandinavia orientem versus usque ad Jakutiam occurit.

Spec. typ.: Jugorsky Schar, inter p. Chabarovo et ostium fluminis Ogo, 18 VIII 1921, leg. A. Tolmacev.

A *F. arenaria* Osb. glumis paleis inferioribus antherisque subduplo minoribus, stolonibus brevibus, non repentibus et oecologia alia, atque a *F. rubra* (l. vel var. *barbata* Hack.) glumis latioribus, obtusiusculis, oblongo-ovatis (nec lanceolatis), pilosulis et paleis inferioribus longe denseque crispato pilosis (nec sparse breviterque pilosiusculis) differt. *F. eriantha* Honda et Tatewaki ex Kamtschatka habitu simillima, sed vaginis laminarum facieque suprema pubescentibus, glumis lanceolatis acutis longioribus (ad 5—6 mm gl. super. 3—4 mm gl. infer.), paleis inferioribus ad 5—6 mm longis angustioribus et paleis superioribus superne externeque breviter puberulis distincta.

78. *Festuca aucta* V. Krecz. et Bobr. — *F. rubra* var. *paludicola* Kom. Fl. penins. Kamtsch. I (1927) 188. — *F. rubra* var. *barbata*, ib., ex p. — Planta laxe caespitosa, culmis 30—80 cm alt., laevibus, nitidis, foliis innovationum elongatis, ad $\frac{1}{2}$ culmi protractis, planis vel subconvolutis, ad 2.5 mm lat., vix asperulis, cum vaginis pubescentibus, foliis culmeis ad 10 cm lg., planis, 3—4 mm lat., scabriusculis cum vaginis latis glabrisque. Panicula secunda, subnutans, laxa, ramis flexuosis, scabris; apiculis oblongis, primum constrictis, tardius divaricatis, 10—16 mm lg., 7—11-floris, viridibus vel violascentibus laxulis cum raxide scabra; glumae acutae, carinatae, suprema—6—7 mm lg., lanceolata, margine membranacea et ciliolata, apice scabra, ima—anguste-lanceolata, 4—4.5 mm lg.; palea inferior lanceolata, ecarinata, convexa, 6—7 mm lg., tota—setuloso-asperula vel interdum breviter hirsuta, venis obsolete, in aristam scabram ca 3 mm lg. contracta; palea superior anguste lanceolata, ad carinas ciliolata, apice scabrella, bidentata. Anthera oblongae, 3.5—4 mm lg., obscure violaceae.

In pratis et herbosis siccis peninsulae Kamtschatka et insularum Comandorum et Kurilensium nec non Sachalin.

Spec. typ.: Ins. Bering. 25 VIII 1894, N. Grebnitzky.

A *F. baicalensi* (Griseb.) nob., cui proximior, caespitibus breviter stoloniferis, spiculis stramineo-viridibus, latis, 7—12-floris, glumis longioribus atque paleis inferioribus per totam faciem setuloso-asperulis differt.

79. *Festuca chalcophaea* V. Krecz. et Bobr. — Planta multicaulis dense caespitosa culmis 20—50 cm altis tenuibus laevibusque; folia (innovationum et caulina) setiforme convoluta, non rigida, abbreviata, vaginis pallide brunneis inferne vestita. Panicula recta congesta 3—7 cm lg., axi ramulisque scabridis, spiculis oblongis 8—12 mm lg. 4—6-floris obscure brunneis chalcaeostriatim nitentibus; glumae acutae carinatae marginibus minute setuloso-denticulatae sub apice externeque saepe scabriusculae, superior — lanceolata, 4—5 mm lg. nervis tribus evidentibus instructa, inferior — ca 3 mm lg. cuneato-lanceolata. Palea inferior lanceolata ca 5 cm lg. superne dorso scabrida subcarinata marginibus membranacea lacinioso-ciliolata apice obtusata, aristis scabris ca 2 mm lg. instructa, basi ad carinam et ad venulas scabriuscula, nervis obsoletis, violacea ad margines brunnescens chalcæo striatim nitens; palea superior oblongo-lanceolata breviter bidentata superne ad carinas minute setulosa in facie externa sub apice hirsutiuscula. Antherae oblongae 2.5—3 mm lg.

In pratis alpinis Caucasi Magni et Armeniae.

Spec. typ.: Armenia. Nor-Bajazet, leg. Zedelmeyer et Heidemann.

A *F. Kryloviana* Reverd. cui proxima glumis scaberrimis majoribus brunescens violaceis chalcæo striatim nitentibus et paleis superne sub apice hirsutiusculis bene differt.

80. *Festuca baicalensis* (Griseb.) V. Krecz. et Bobr. — *F. nigrescens* Turcz. Cat. Baic. (1840) № 1305, non Lam. — *F. rubra* β *baicalensis* Griseb. in Ldb. Fl. Ross. IV (1853) 352 (quoad plantam baicalensem). — *F. rubra* var. *arenaria* Roshev. in Fl. transb. I (1929) 69. — Planta violascenti-viridis stolones elongatos flagelliformes emittens, culmis 40—80 cm altis erectis vel geniculato-adscendentibus, foliis abbreviatis planis vel canaliculatis ad 2.5 mm latis vaginis superioribus glabris vel pubescentibus basalibus erubescensculis culmos late vestientibus, ligulis fimbriatiformibus. Panicula oblonga $\pm$ contracta 5—15 cm lg. apice subnutans axi ramulisque scabridis spiculis oblongo-lanceolatis fere linearibus 10—15 mm lg. 3—4 mm lat. axi setuloso scabridoglumae valde inaequales acutae $\pm$ carinatae marginibus minutissime setulosae anguste membranaceae, superior — lanceolata 5—6 mm lg. inferior — cuneato-lanceolata 3—3.5 mm lg.; palea inferior late lanceolata 6—7 mm lg. violacea in parte superiore scabriuscula interdum pubescens, carina scabrida ad apicem elevata, in aristam scaberrimam ca 4 mm lg. abiens marginibus minutissime setulosa venis 5 obsoletis lateralibus late distantibus; palea superior lanceolata bidentata ad carinas ciliolata interdum superne extremeque puberula. Antherae anguste lineares ca 4 mm lg.

In sabulosis lacus Baicalensis.

Spec. typ.: ad Baicalem in arenosis. 1834, Turczaninov.

A *F. rubra* L. glumis valde inaequalibus paleis inferioribus, antheris majoribus, coloratione magnitudineque omnium partium et stolonibus flagelliformibus bene differt.

81. *Festuca egeana* V. Krecz. et Bobr. — *F. rubra* var. *glabra* Trautv in A. H. P. V (1877) 125. — Planta rhizomate subrepente, culmis haud numerosis laevibus erectis ad 40 cm altis, folia innovationum falcata ad 1 mm

lata praecipue plana vel complicata ad 10 cm lg. caulina $\pm$ plana abbreviata ad 3.5 mm lata supra scabra ad 6 cm longa ligulis subnullis vaginis inferioribus rubescente brunneis. Panicula contracta, fere lineari—oblonga, ramis ramulisque abbreviatis $\pm$ laevibus, spiculis oblongo-lanceolatis 8—12 mm lg. 4—6-floribus densis pallide violaceis interdum viridibus axi scabrido; glumae obsolete carinatae apice obtusatae marginibus apiceque albido-ciliolatae, superior—oblongo-ovata ad 4 mm lg., inferior—cuneato-lanceolata 2.5—3 mm lg. venis obsoletis; palea inferior oblongo-lanceolata ad 6 mm lg. marginibus ciliolata subito in aristam abbreviatam (2 mm) scabram abiens convexa superne scabriuscula violacea dorso viridis marginibus anguste membranacea; palea superior lanceolata ad carinas superne ciliolata externe scabrida. Antherae oblongae 2.5—3 mm lg.

In locis arenosis herbosis tundrarum Jacutiae.

Spec. typ.: Jacutia, distr. Kolymsk, prope Pochodskoje, in pratis paludosis, 24 VII 1905, leg. I. Schulga.

A *F. rubra* L. et *F. baicalensis* nob. glumis obtusatis, margine ciliolatis, paleis inferioribus obtusatis, forma et habitu pauperculo differt.

82. *Festuca Ruprechtii* (Boiss.) V. Krecz. et Bobr. — *F. ovina* var. *Ruprechtii* Boiss. Fl. or. V (1884) 619. — *F. ovina* ssp. *frigida* var. *Sommieri* St.-Yves in Candollea III (1928) 371. — *F. sulcata* var. *Ruprechtii* Grossh. Фл. Кавк. I (1928) 117. — Planta viridis, dense caespitosa, culmis 5—15 cm altis tenuibus rectis laevibusque, basi vaginis laevibus brunnescentibus obtectis, foliis capilliformibus (0.2—0.3 mm in diam.) laevibus vel superne scabriusculis subrecurvatis in sectione transversali cuneato-ovatis i. e. lateribus planis. Panicula sublinearis flexuosa, 3—6 cm lg. ramis basalibus 2—3-spiculosis abbreviatis, spiculis oblongo-ellipticis 5—7 mm lg. virescenti-violaceis, 4—6-floris; glumae inferiores—subuliformes, ca 2 mm lg., superiores—lanceolatae, ca 2—3.5 mm lg., acutae, sublaeves; palea inferior lanceolata ca 4—4.5 mm lg., apice subscabra, arista $\frac{1}{3}$ paleae infer. aequanti instructa; antherae 2 mm lg.

In alpinis Caucasi totius.

Spec. typ.: prope Diklo in m. Kawtari, Caucasi orient, Tuschetia, 2 Aug 1861, leg. Ruprecht.

A *F. supina* Schur, cui proxima, differt caespitibus densioribus culmis laevibus foliorum lateribus planis (nec convexis) paniculis duplo longioribus flexuosis ramis imis 2—3 (nec 1—2)-spiculosis spiculis praecipue virescentibus, paleis inferioribus angustioribus.

83. *Festuca mollissima* V. Krecz. et Bobr. — *Festuca ovina* Kom. et Aliss. Key pl. East. Reg. URSS I (1931) 233, non L. — Planta virescens, mollis, caespites densos formans, culmis 15—30 cm altis tenuibus flexilibus laevibusque foliis mollibus laevibus planiusculis (ca 1—1.5 mm lat.) vel plicatis $\pm$ rectis primum culmum aequantibus demum brevioribus. Panicula pauca oblonga unilateralis apice subnutans ca 3 cm lg. spiculis solitariis vel basi ad ramulos breves geminis oblongis ca 1 cm lg. 4—5-floris divaricatis, viridibus laeviter violascentibusque; glumae lanceolatae acutae apice $\pm$ scabrellae ima 5 mm lg.

sup.—6 mm lg.; palea inferior lanceolata superne breviter pilosiuscula 6 mm lg., arista $\frac{1}{2}$, glumellae aequanti instructa; palea superior aequilonga scabrella, antherae 2.5 mm lg.

In fissuris saxorum et in locis montanis litoralibus URSS Orientis Extremi per reg. Ussuriensem, Amurensi-Udensem et Ochotiam nec non in ins. Sachalin.

Spec. typ.: Sinus de Castrie, VII 1854, leg. Maximowicz.

Species e serie *F. Krylovianae* Reverd. de qua foliis angustioribus laevibus plicatisque spiculis pallidioribus; paleis inferioribus longioribus et omnibus partibus in tactu mollioribus differt, atque a grege *F. ovinae* L. facile dignoscitur foliorum plicatorum forma.

84. *Festuca coelestis* (St. Y.) V. Krecz. et Bobr. — *F. ovina* ssp. *coelestis* St. Y. in Candollea III (1928) 376. — Planta viridis, dense caespitosa. Culmi tenues, stricti, 5—20 cm alt. superne subhirtellis basi vaginis vetustis brunnescentibus brevibus obtectis foliis setiformi-convolutis 0.5—0.6 mm in diam. rigidiusculis rectis abbreviatis laevibus in sectione transversali ovalibus (i. e. lateribus convexis). Panicula densa, brevis 2—2 cm lg., linearis, ramulis 1—2 (3)-spiculosis, spiculis ellipticis, violaceis, 5—6 mm lg., 3—6-floris; glumae imae angustatae lanceolatae acutae ca 2 mm lg.; superiores—late lanceolatae, fere ovatae ca 3 mm lg. acutiusculae, ambae marginibus ciliolatae; paleae inferiores late lanceolatae, fere ovatae, circiter 3.5—4 mm lg. brunneo-violaceae, laeves, arista $\frac{1}{3}$ paleae infer. superanti instructae; palea super. superne carinis dorsoque scabrella. Antherae 1—1.5 mm lg.

In alpinis alt 2—4000 m. s. m. montium Tian-schan et Pamiro-Alai Asiae Mediae.

Spec. typ.: Schugnan, inter Khoj-Tegen et Karagorum 20. VII. 1904 № 129, leg. B. Fedtschenko.

A *F. brevifolia* R. Br. cui proximior antheris longioribus (1—1.5 nec 0.7—1 mm lg.), paleis inferioribus brevioribus brunnescentibus, culmis apice subhirtellis caespitibus densioribus diversa est.

85. *F. dahurica* (St. Yves) V. Krecz. et Bobr. — *F. ovina* ssp. *laevis* var. *dahurica* St. Yves in Bull. Soc. Bot. Fr. LXXI (1934) 40. — Planta cinereo-viridis, rigida, dense caespitosa, culmis 25—40 cm altis, rectis, rigidis, laevibus, foliis setiformibus, 0.6—0.7 mm in diam., rigidis, curvatis, apice obtusatis, laevibus, in sectione ovalibus (lateribus convexis), vaginis basalibus dilatatis, nitidis, laevibus, brunnescentibus. Panicula oblonga 5—8 cm lg., densa, spiculis oblongo-ellipticis, 7—8 mm lg., 4—6-floris, viridibus vel vix violascentibus; gluma ima 2—2.5 mm lg., suprema—3—3.5 mm lg., ambae—acutae, apice scabellae; palea inferior late lanceolata, 4—5 mm lg., apice mutica vel breviter setulifera, superne scabra; antherae 2 mm lg.

In arenis et locis solo arenoso regionis cis-et transbaicalensis cum Mongolia collimitaneis.

Spec. typ.: *Dahuria selengensis*, in arenosis prope p. Verchnjaja Strelka 9. VI. 1912, leg. V. Smirnov.

A *F. jacutica* Drob. cui proxima, habitu humiliore, foliis incrassato-setaceis (0.6—0.7 nec 0.3—0.4 mm in diam.), panicula congesta, subspicata ramulis abbreviatis, omnium partium duritie et oecologia differt.

86. *F. amblyodes* V. Krecz. et Bobr. — *F. violacea* var. *kaschmiriana* Hack. in B. Fedtsch. Fl. Pamir. (1903) 206. — Planta caespites densos tapeti formes formans, culmis ex caespite excedentibus ca 15 cm alt., laevibus, basi vaginis pallidis laxe vestitis, foliis basi remotis, ad 3 mm lg., plicatis, breviter acutatis, apice scabris; stolones laterales vaginis brunneo-rubentibus, transverse rugulosis, saepe fibrillosis dense vestiti, foliis eorum 5—6 cm lg., rigidulis, caesiis, falcatis plicatis scabrisque. Panicula parva, in statu florente patula, serius subspicato-coarctata, 2—4 cm lg., axi ramulisque scabriusculis, spiculis cum rachide laevi, primum constrictis, demum divaricatis, oblongo ovatis, 8—12 mm lg., 4—6-floris, violaceis; glumae obtusatae, vix carinantes, violaceae, dorso virentes, marginibus vix crenulatae, superior — ad 4 mm lg. oblongo-ovata, cum venis lateralibus evanescentibus, apice obtusato-apiculata, ima — lanceolata, 2.5—3 mm lg.; palea inferior lanceolato-ovata, nervibus 5 obsoletis percursa, 5—6 mm lg., superne carinata et scabrella, obtusata, interdum breviter aristulifera, violacea, sup rne marginibus hyalina, laeviter crenulata; palea inferior lanceolata, bidentata, superne ad carinas scabrella. Antherae lineares, ca 3 mm lg.

In alpinis montium Pamiro-Alai Asiae Mediae.

Spec. typ.: Pamir, in declivis australibus Kisyl-Art pass. IX 1911, № 175, leg. B. Fedtschenko et R. Roshevitz.

Ab omnibus speciebus subgeneris *Phaeochloa* Griseb. differt caespitibus tapetiformibus, stolonibus ruguloso-vaginatibus, foliis abbreviatis falcatis obtusatisque, panicula pauciflora, glumis paleisque inferioribus dilatatis obtusatis margine subcrenulatis, palea infer. praecipue haud aristata, atque antheris brevioribus.

87. *Festuca tianschanica* Roshev. (mscr.) — Planta perennis, 20—70 cm alta, saepe caespites densos formans; rhizomate breviter repente; culmus erectus, tenuis, glaber; folia anguste-lineararia, ad 2 mm lata, mollia, longitudine plicata, extus glabra, laevia; vaginae foliorum longae, scabridae; ligula brevissima. Panicula paucispiculata, late-effusa, 8—20 cm longa, rami paniculae ad 10 cm longi, tenues. Spiculae anguste-lanceolatae, 7—12 mm longae, 5—8-florae, lilacinae; glumae steriles acutae scabridae: inferior anguste linearis, 3.5—4 mm longa, superior lanceolata, 4—4.5 mm longa. Palea inferior glaberrima, laevis, 6 mm longa, nitida, apice albido-membranacea, distincte venosa, acuta vel breviter, ad 1.5 mm aristata, rariter mutica (var. *submutica* Roshev.).

Spec. typ.: Kasakstan orientalis, districtus Dsharkent, in montibus Karatau, ad trajectum Essek-art-kan. 6 VII 1910, № 2043. leg. A. Michelson.

Differt a *F. tristi* Kryl. et Ivanitz. foliis mollibus plicatis (non convolutis), panicula late effusa, spiculis 5—8-floris et glumis brevioribus, 3.5—4—4.5 mm longis.

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- Alt. - Altai
Amer. - America
Amu-Dar. - Amu-Dar'ya
Anad. - Anadyr'
Ang. - Sayan. - Angara-Sayans,
Aral. - Casp. - Aralo-Caspian region
Asia, Trop. Subtrop. Centr. North.
 South. East. West.
As. Min. - Asia Minor
Atl. - Atlantic
Austral. - Australia
Balk. - As. Min. - Balkans - Asia
 Minor
Batum. - Batumi
Casp. - Caspian
Cauc. - Caucasus, North. South.
 East. West. Centr.
Ciscauc. - Ciscaucasia, North. South
 East. West. Centr.
Chuk. - Chukot coast
Crimea, North. South. East. West.
 Centr.
Dag. - Dagestan
Daur. - Dauria
Dnep. - Dnieper; Upp. Dnep., Low.
 Dnep., Mid. Dnep.
Don - Don; Upp. -Don. Low. -Don ,
 Mid. -Don
Dv. Pech. - Dvina - Pechora [region]
Drung. - Kashg. - Drungaria -
 Kashgaria
Drung. - Tarb. - Drungaria -
 Tarbagatai
Eur. - Europe. Centr., South., East.,
 North., West., Atl., Arct.
Gr. Cauc. - Greater Caucasus
Himal. - Himalayas
Ind. - Him. - India-Himalayas
Irt. - Irtysh
Jap. - Chin. - Japan-China
Kamch. - Kamchatka
Kar. - Lap. - Karelia-Lapland
Kop. - Dag. - Kopet-Dagh
Kyz. - Kum - Kyzyl-Kum.
Lad. - Il'm. - Ladoga-Il'men'
Laz. - Lazistan
Len. - Kol. - Lena-Kolyma region
Medit. - Mediterranean; East. North
 South. East. Centr.
Mong. - Mongolia
Nov. Zem. - Novaya Zemlya
Ob. - Ob' region
Okhot. - Okhotsk
Pam. - Al. - Pamir-Alai
Pribalkh. - Pribalkhashskii Raion
 [Lake Balkhash region]
Prichern. - Prichernomorskii Raion
 [Black Sea Region]
Sakh. - Sakhalin
Scand. - Scandinavia
Siberia, East., West., South.,
 North., Centr.
Syr-Dar. - Syr-Dar'ya
Tal. - Talysh
Tob. - Tobol, Upp., Mid., Low.
Transcauc. - Transcaucasus
Turk. Arm. - Turkish Armenia
Turk. Laz. - Turkish Lazistan
Turkes. - Turkestan
Turkm. - Turkmenia
Tyan' - Shan. - Tien Shan
Ud. - Uda region
Ussur. - Ussuri
Volg. - Volga
Volg. - Don - Volga-Don
Volg. - Kam. - Volga-Kama
Yenis. - Yenisei
Zabaikal'e - Transbaikalia [Trans-
 baikal region]
Zavolz. - Zavolzskii Raion
 [Trans-Volga region]
Ze. - Bur. - Zeya-Bureya

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